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# GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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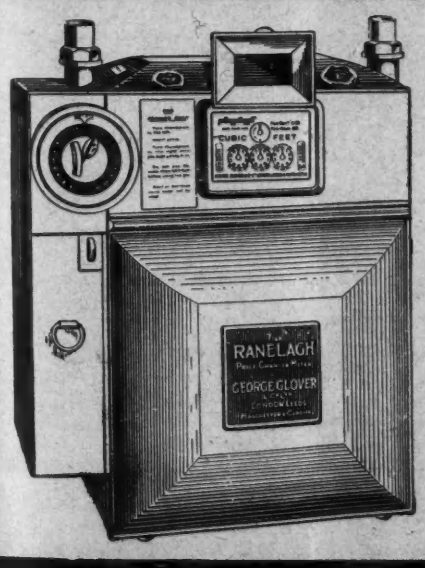


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VOL. CLXII., No. 3133.] WEDNESDAY, MAY 30, 1923. [75TH YEAR.


## EDITORIAL NOTES.

### Restoration and Progress.

THE gas industry has never swerved from the course of steady progress. In ministering to the requirements of the public, it has, of course, suffered very heavy drawbacks through the enormous costs of war time and of the years succeeding, together with the capital-raising disabilities imposed upon all gas companies operating under the sliding-scale, as well as upon not a few maximum price concerns, which had to take refuge under the Temporary Increase of Charges Act. But those times are vanishing, though there still remains a substantial remnant of the effects of those years, as found expressed in the higher costs per unit of production or business done than those that anteceded the war. The Gas Regulation Act has helped towards rehabilitation, though we rather fear it cannot be said that there has been adequate recognition throughout the industry of the effects of the Act on the general well-being, through the enormous assistance it has rendered in re-establishing public and capital-investing confidence in gas undertakings. However, there is abroad in the industry to-day a spirit of thankfulness that a combination of helpful circumstances has restored to gas undertakings generally the means of once more making progress along the path of prosperity. We still have our eyes fixed on prices per therm which will be the equivalents of those that ruled on the volumetric basis in the years anterior to the war. Some favoured gas undertakings—favoured in regard to coal availablity, low capital accounts per unit of consumption, and good coke markets (particularly the export ones)—are in close touch with those pre-war prices; others are moving towards them as rapidly as possible. We do not despair of their reaching the goal by the paths of better economies and efficiencies to which studious investigation has directed their technical men, coupled with the enthusiasm that has spread over the industry in the work of promoting the increased use of gas and extending its applications in new directions. It can be truly said, from close observation, that we have never known the industry to be so busy as it is to-day in its commercial operations.

In later columns this week, we have reviewed "Field's Analysis" for 1922; and this we are able early to do through the courtesy of Mr. H. E. Ibbs, the compiler of the book and Accountant of the Gas Light and Coke Company. There is always a certain fascination about this work, owing to the nature of its contents, and the fact that it has a place and a recognized intrinsic value that have endowed it with the title of a "standard" work. It is true that it only deals with thirty-five gas undertakings; but it is equally true that those undertakings are responsible for the production of 56 p.ct. of the total gas produced by the gas undertakings of Great Britain and Ireland. The interest found in the data has increased with the advent of the therm system of charging, and the acceptance of the fact that the therm provides a better and more reliable basis of comparing manufacturing costs and results than the old cubic feet basis with the vitiations supplied by the variables—thermal value and percentage of incombustibles. As we have remarked in the review of the new issue of the work, the process of transition from the old system to the new has not yet been fully accomplished; and the volumetric basis still holds sway in some of the well-known undertakings. But the Analysis shows progress in making the change; it will do so continuously year after year, until all the statutorily controlled concerns are brought into the therm fold. It is positively clear now that those who are withholding application under section 1 of the Gas Regulation Act will be the possessors of Orders before very long. The Board of Trade cannot ignore the primary recommendation of the Therm Charges Committee, that the therm system should be made universal in statutory gas supply; and it is patent that the Board have no intention of ignoring it. We say this with the statement before us of the Director of Gas Administration (Mr. H. C. Honey) during the proceedings on the Rawmarsh Gas Bill, owing to the desire of the Committee to consult him on the point as to the fixing of a price on the therm basis, or allowing a maximum price to go through on the per 1000 c.ft. basis. Mr. Honey then said that, in view of the recommendation of the Departmental Committee, the Board do not feel that they ought to agree to such an undertaking as Rawmarsh remaining under the old system any longer than is absolutely necessary. This is pretty definite evidence as to what is going to happen.

However, the Analysis invites comparison to be made with past years in order to inform ourselves as to how we are faring in respect of restoration and progress. Generally, the data disclose, by contrast, that costs are declining, charges for gas are decreasing, and reserves are on a more substantial footing; and, as a consequence (this the Analysis does not indicate), market prices of gas stocks and shares are hovering to-day round about the par price, though many of them depreciated by something like 50 p.ct. in those ugly years not far removed from the present. As to costs, if we take coal alone, it is seen that the peak prices per 1000 c.ft. were in 1920 and 1921, though all the other years subsequent to 1914 ranged higher than the preceding ones. If we take the peak figures of (as the case may be) either 1920 or 1921, and compare them with those that obtained in 1922, it is found that last year the cost of coal per 1000 c.ft. of gas sold was lower in the case of the Gas Light and Coke Company by 16·69d.; South Metropolitan Company, by 12·61d.; Commercial Company, 12·7d.; suburban companies, 11·55d.; provincial companies, 13·17d.; the Dublin Company, 11·96d.; provincial corporations, 2·84d.; and Scottish corporations, 3·23d. A curious thing is that the provincial corporations, who had been doing so much better than the London Companies in respect of coal per 1000 c.ft. of gas sold, should in 1922 be so much worse off than them. While the costs of coal per 1000 c.ft. sold in the case of the three latter were in that year: Gas Light 27·39d., South Metropolitan 31·17d., and Commercial 28·92d., the provincial corporations' figure remained at 35·13d., and yet the provincial companies were down to 25·93d. The capital charges have risen, due largely in the case of the companies to the ability to pay more appropriate dividends.

In regard to business, the figures show progressiveness; and we know from the quantity of coal still being used for domestic purposes that there is abundant room for more. The sales during 1922 are described in the review of the Analysis as being on the whole satisfactory. Of course, industrial and trade depression left a deep impression upon them in these two directions, and the buying powers of the people were not so extensive as when employment has closer proximity to the normal level. Nevertheless, in that year, 23 of the undertakings out of the 35 dealt with in the work exhibit increases in consumption—in one case, nearly 14 p.ct. Comparison is made with twenty years ago. In 1902, the consumption of gas in the Metropolis was 37,532 million c.ft.; last year, 55,038 millions. In the suburbs in

the same period, the sales have risen from 8650 millions to 18,588 millions; and in the case of the included provincial undertakings, from 12,463 to 20,680 millions. The respective increases were 17,506 million c.ft. (47 p.ct.); 9938 million c.ft. (115 p.ct.); and 8217 million c.ft. (66 p.ct.). There are two points to be noticed about these figures—one is that the rate of volume increase has been (despite the war and the subsequent bad industrial and trading years) greater during the past twenty years than in any previous twenty years since the inception of public gas supply; and the other is that, in view of the volumetric increase, and the extensive basis on which the percentage increase is calculated, the increase expressed as a percentage does not convey much of value. What would have represented a 47 p.ct., an 115 p.ct., or a 66 p.ct. increase in days gone by would have been smaller volumes than those required to work-out to those percentages in 1922. Bearing these points in mind, the statement in our review that the increase figures are "remarkable" is fully justified. But the average consumption per consumer has decreased by the lower consuming capacity of the newcomers; inasmuch as the percentages of increase in consumers are much beyond those of the percentages of increase in gas sold. In the case of the Metropolitan Companies, in the twenty years the number of consumers has increased by 111 p.ct.; in the suburbs by 160 p.ct.; and in the case of the provincial companies by 107 p.ct. However, this is a healthy sign; it shows the effect of tapping new strata in the population. Another good effect is the average increase of consumers per mile of main: In the Metropolis, it is from 195 to 320; suburbs, from 126 to 209; and provinces, from 129 to 182. Naturally, the greater the number of consumers per mile of main the better, just as the greater the number of consuming points in a house, the lower per unit of consumption becomes the cost of supplying that house.

Two or three interesting facts regarding calorific value can be obtained by calculation from the analysis. It is found that the average calorific power declared by the undertakings is now approximately 470 B.Th.U., though the average B.Th.U. actually supplied per cubic foot is ten or eleven above this figure. During 1922, five of the companies raised their declared calorific value. In some cases, as many as 15 to 20 B.Th.U. are supplied in excess of the declared figure. We undertake to say that, if correction were made for the temperature difference between the station meters and the consumers' meters, it would be found in some cases that the consumer obtained more than 15 to 20 B.Th.U. per cubic foot in excess of the declared value. One does not appreciate what this means until there is investigation. If 10 B.Th.U. are supplied in excess of the safety margin to the declared value, and 1000 million c.ft. are sold per annum by an undertaking, the excess, at 10d. per therm, would represent more than £4000 a year. It is clear that economy is to be found under the therm system in working with a bare safety margin to the declared value. These are only a few points suggested by the new issue of the Analysis; but there is a wealth of interest in the work which can be investigated by those who become possessed of a copy.

## The Policy of Amalgamation.

When it is beyond question that there are economic and public advantages to be derived from the amalgamation of gas undertakings, and when those advantages are mutual to the companies concerned, then such schemes deserve not only the ratification of the proprietors, but the hearty support of the local authorities and gas consumers in the areas concerned. The principle of concentration of the production of public utilities or provision of conveniences has been endorsed over and over again by Parliament, and in several directions we see it in what has been accomplished in the grouping of the railway companies; it is found in the large Water Boards in different parts of the country, and the ramifications into other local authority districts of some of the municipally owned super water undertakings of the country. The work of the Electricity Commissioners is being directed to large regional generation and distribution of electricity, quite apart from the boundaries set by local government; and the Gas Regulation Act invites schemes of the kind by the facilities given under clause 10—and the one dealing with Special Orders—for such gas-supply concentrations. Many important amalgamations of gas undertakings have taken place which have translated medium-sized concerns into large proportions, and have conferred advantage upon all the participants. Among the Companies that jut into the London area and hem in the three Metropolitan Companies, the South Suburban, the Wandsworth, and the Brentford have broadened their areas extensively by amalgamation; and the districts they have taken under their wings have had good cause to bless the day when some inventive mind conceived the idea of conferring upon them the benefits of annexation by a larger gas-distributing undertaking. The advantages of such action are reciprocal; if they are not, then they should not be entertained, for one of the two parties would suffer.

The latest important gas fusion scheme is that of the Brentford Company with the Harrow and Richmond Companies. Examining the cases that have been presented for this course—particularly the statement made by Mr. R. J. Neville Neville, at the meeting of the Brentford proprietors last Friday—we do not know of anything in this line that has had greater merit, or has been more naturally appropriate. Here the Brentford Company's area makes a big incision right away to the heart of the Harrow area; and the Richmond Company's area dives well into the Brentford district. In such circumstances, the best distribution arrangements cannot be evolved. Besides removing these irregularities, there are obvious developing facilities for the large Company. Both the smaller concerns have areas which it will be a benefit to the Brentford Company's future to have; both areas will unquestionably derive material advantages which it might take years to realize by continuing a separate gas-supply existence. Moreover, the Brentford Company have surplus manufacturing plant which can absorb the increasing load of the smaller companies without any immediate further expenditure of capital for this express purpose. The development of the districts themselves will be facilitated by the new order of things. Of this there can be no doubt. With these amalgamations, the Brentford Company will make a big step forward in rank in respect of magnitude. In 1921, the Chairman told the proprietors that the undertaking was the seventh largest in the British Isles, and the third largest in the Metropolitan area. If the amalgamations go through, the Company's existing area of 90 square miles will be extended to 130 square miles. Other Companies can boast of larger areas; but this will stand near the top in this respect. To the Company's existing sales of 4619 million c.ft. per annum, another 888 millions will be contributed by the Harrow and Richmond districts—making the output 5507 million cubic feet. But magnitude is not the reason for amalgamation; the only justification for such a scheme is the public advantage which will emerge from the greater economic and trading opportunities that will present themselves through the combination.

We shall be sorry to see the independent careers of the Harrow and the Richmond Companies brought to a close. They are old associations; and the men who raised them from small enterprises to substantial ones are, or were, old friends. But sentiment cannot be allowed to stand in the way of progress. The undertakings have served their areas well. But times and conditions have changed; and the day has now apparently arrived when consolidation with a large neighbour will be fruitful of further good. Hence the application for a Special Order for the necessary powers, and the agreement with the scheme of the stockholders of the three Companies.

## The Call for Cheap and Efficient Burners.

There is much evidence that the manufacturers of gas-consuming appliances of all kinds are directing their knowledge and energies to the realization of higher efficiencies. Accompanying this there are two other essentials which we are also pleased to note are not being overlooked. In structural details, there have hitherto been, in certain types of gas-using appliances, defects in material and design which have given consumers the right to complain; and there is the point as to price. Regarding the latter (though highly important to the industry), we would at the present time rather not press home too far, in view of sound make combined with reliability and efficiency having superior claim. It appears to us that the first desideratum is to get the types of appliances required; and then to examine the matter of prices. Properly designed, constructed, efficient, and reliable burners and appliances are as vital to the progress of the industry as are the cheapest possible therms. It has

been proved by the Gas Investigation Committee of the Institution of Gas Engineers and the Leeds University that, given adjustable burners, town gas, within a wide range of composition and calorific value, can be used with equal efficiency, or approximately so. This being the case, then the burners, for whatever purpose, which will aid the gas in realizing the highest efficiency, having regard to practical application and convenience in use, are the requisite complement to the gas produced and sold at the lowest possible rates. Cheap and efficient gas and cheap and efficient appliances are a combination that will help the progress not only of the gas-supply industry, but of the manufacturers of the appliances.

In other columns there is an article under the heading "The Call for Cheap and Efficient Burners." It refers to lighting burners. We have been pleased with the progress in design and efficiency realized by some of the well-known makers of gas-burners; but these manufacturers suffer more than some people imagine from the cheap, inefficient, and ill-designed burners with which the market is flooded. Dissatisfaction with such burners is often made the ground for a general condemnation not only of the gas supply, but of all sorts and conditions of burners; and this, with the considerable sales of the "cheap and nasty" type of burner, has a reflex action upon the ability of the producers of good burners to effect the lowering of costs by progressive mass production. However, we want the manufacturers to note this—that the call for cheap and efficient burners is not something of recent birth. It has been going on for years; and, as the article in other columns shows, at the meeting of the Institution of Gas Engineers last year (in the discussion on Dr. Carpenter's paper, which urged immediate action in this direction), the "call" was still heard, and that from several responsible engineers. Are these engineers right in saying that what is required is not on the market? The manufacturers of gas-burners might, in turn, appositely ask the critics individually to take the various types of their burners and tell them what are the defects of which they complain, in order that they may, by research and experiment, endeavour to eliminate them. In such a matter as this, a charge couched in the language of generalities is not so helpful as specific criticism which points to what is actually wrong. We know well the cheap, flimsily constructed, and inefficient burners; but there must not be wholesale condemnation because of them. They are here in strong force, working destruction upon the interests of the gas industry. But why is it they are here in such strong force? In considering this question, one cannot help asking whether those who complain have done their utmost among the local tradesmen and the consumers in their areas of supply to stem the flow of adoption of these burners, and thus the flow of dissatisfaction. Someone has to take action if effective work is to be accomplished in this direction. And those who should take the action are those who have the largest and most immediate interest in the matter; and they are the gas suppliers.

However, as we have said, there are makers of burners who have productions that are not inefficient. If in detail they are capable of improvement, then no doubt the makers will be glad to have information to that effect, and to do everything to find the remedy. Meantime, the specification of a standard inverted burner has been prepared by a Committee of the Society of British Gas Industries; and it has been endorsed by a Committee of the British Commercial Gas Association. Shortly, licences will be issued for the manufacture of the burner. This fact is significant of a desire for something in the way of a standard burner, and of an attempt to meet that desire. This burner is probably one of the instruments by means of which there will be contest with the rubbish that is doing so much harm; and, if it is successful in this, it will be serving the burner makers quite as much as the gas-supply industry. No doubt, too, every burner maker of standing has been struck by the persistent "call," and has, in consequence, been examining the material of which his burners are made, the design and finish of every part, and the resulting efficiency of the combination, to ascertain whether the charge can be fairly applied to his products. In this connection, a new burner Company—Burners (1921) Ltd.—direct our attention to the fact that the programme of effort with which they set out, before Dr. Carpenter's paper was read, incorporated the details of requirement of which we have heard so much. As to the efficiency of the Company's burners, independent tests of the series have been carried out by Messrs. Alexander Wright & Co., Ltd.; and they are included in the article. The tests were made at four angles; and the excellent results are corroborative of the claims.

Whether or not criticism is justified in all cases, if the "call" for higher efficiency and cheaper burners does good in progressively relieving the industry of the shoddy ones, which mostly have birth abroad, then there will be all-round gratification. The British burner makers can do their part in this by supplying what is needed; but the gas undertakings in each locality—being on the spot—must also do their part, and that vigorously. There are good and efficient burners on the market; if burners of still higher character can be obtained, so much the better. But those that are good and efficient and are available should be utilized in a persistent campaign to oust those things which are doing an incalculable injury to the industry.

## The Common Sense of Factory Lighting.

WHEN one considers what a small proportion of the total costs of the running of a factory an efficient system of lighting represents, and what an expensive matter it is to promote, through inadequate lighting, inefficiency in the operatives, a reduction of the output of the works, and favourable conditions for accidents, there is enough in these considerations to question the efficiency of those charged with the management of factories where such conditions obtain For the sake of their own reputations, the owners, or those charged with the administration, of manufacturing establishments ought to give as much heed to the lighting as to the buying of materials and the selling of the products. Notwithstanding, strange as it may appear, there are all over the country numerous instances in which the lighting of factories is about the last item in the manufacturing system to receive attention; and yet it is a factor of no mean importance. Good lighting is an effective contributor to man and works efficiency, and to safety and health; and these things represent money in the qualitative and quantitative gains in production, and in the saving of unnecessary expenditure in compensation.

There have been great advances in the knowledge of lighting requirements for factory purposes, whereby better general illumination can be effected, a sufficiency concentrated on the work, and the eyes of the workers protected from the glare of metallic filament or gasfilled electric lamps. These points indicate that, in selecting a system of lighting, the management should have a care that the best is provided to give the needed light on the most economical terms, and furthermore a system which will not be detrimental in depreciating the visual powers of the workers, and will be reliable. The most reliable agent for lighting is town gas; the intrinsic brilliance of incandescent gas lighting for equal illuminating power is far below that of electric lamps. Mr. Leon Gaster, the Hon. Secretary of the Illuminating Engineering Society, recently read a paper, before the Royal Society of Arts, on "Industrial Lighting and the Prevention of Accidents." This paper was more or less a summary of well-known knowledge to students of the subject; but the gospel of lighting efficiency in factories is one which has to be preached over and over again in order to impress the message where it is most wanted. The resistance of custom is something against which only plodding, persistent work will prevail. The progress of civilization has been gradual; the progress of lighting reformation in factories will likewise be gradual. Therefore, such apostles as Mr. Gaster should never lose an opportunity; and as a matter of fact, in this particular mission, we have never known him to do so.

The point has frequently been raised that, if factory owners will not realize the economies of good lighting, then, in the interests of life and limb, there should be legislation which would impose the obligation of adequacy, with liability to penalties for any infraction. The Departmental Committee who considered this subject found that this was easier said than done, if only for the reasons that different occupations and the diversity of visual powers require widely varying quantities of illumination. At the same time, legislation imposing grades of general lighting is quite feasible; and given this, it would open the door to a greater perfection. Mr. Gaster hopes that in the future the conclusions reached by the Departmental Committee who investigated this matter of factory lighting will be embodied in legislation which will deal with light, heat, and ventilation jointly as essentials to health, safety, and efficiency in

work. And Sir Malcolm Delevinge, K.C.B., Assistant Under-Secretary of State (Home Office), said on the occasion that he did not think it would be any violation of official secrets to say that the next Factory Bill will contain a clause dealing with lighting. Perhaps, too, in time matters will go further than general legislation; for arrangements have been made in a number of industries for the collection of additional data bearing upon requisite illumination for different classes of work. This gleaning of actual data was a matter the Departmental Committee emphasized as necessary to the further progress of the application of scientific illumination to industrial operations—whether applied compulsorily, or by the dictates of common sense. Improved lighting in factories directed by such common sense is proving all that the advocates of higher lighting efficiency have claimed in regard to its profitableness and the promotion of health and safety. Such demonstration is valuable.

## Oxygen Production for Carbonization or Complete Gasification.

By references in the Technical Press to the costs of the production of oxygen, reminder is from time to time given of the subject of the utilization of a steam-oxygen process for the carbonization or the complete gasification of coal. Of course, there are limits; but it is well known that the cost of oxygen depends to a large extent upon the capacity of the producing plant. The point has been made by Prof. Cobb and Mr. H. J. Hodsman, and very emphatically by Mr. E. A. W. Jefferies, of Worcester, Mass., as was seen in issues of the "Journal" in March and April, 1921. The first two investigators (who foreshadowed that, using 107 c.ft. of oxygen with steam in carbonization, an efficiency of 91·1 p.ct. could be obtained, and in complete gasification, using 179 c.ft. of oxygen, an efficiency of 90·1 p.ct.) told us, in their Institution paper in 1920, that, according to the scale of working, it was promised that oxygen could be produced at from 6 c. to 30 c. per 1000 c.ft. Later, Mr. Jefferies stated that, with a 3 million c.ft. plant (operating at full capacity), oxygen could be produced at a cost of 10·1 c. per 1000 c.ft.; with a plant making 2 million c.ft., the cost would work-out to 15·1 c. per 1000 c.ft. These are excellent figures compared with the 10d. and 1s. which have been quoted lately. Those productive capacities, however, put the lower cost out of the immediate reach of many gas undertakings. But assuming the use of 200 c.ft. of oxygen per 1000 c.ft. of gas made, at the 15·1 c. cost, the expenditure for oxygen (at the manufacturing cost) would only amount to 3 c. per 1000 c.ft. of gas; with Prof. Cobb and Mr. Hodsman's estimate of 107 c.ft. of oxygen for carbonization, the cost would only work-out to 1·6 c.; and for the 179 c.ft. required for complete gasification, to 2·5 c. These are quite modest figures; but they are only to be obtained by a large oxygen-producing plant working at full capacity. For the major number of gas-works, therefore, there would have to be reliance upon a central oxygen-producing plant, with the oxygen transmitted compressed in cylinders. This would mean some inconvenience; but with the efficiency predicted, even the inconvenience might be tolerated in order to secure the results.

Our contemporary "Industrial Gases" calls attention to a warning that has appeared in the "Revue de la Soudure Autogène" on the subject of the adoption of small private oxygen-producing plants. An argument that is frequently used by the makers of these small plants is that, owing to the present-day higher cost of transporting oxygen cylinders, a private plant should be adopted, and the oxygen required be produced *in situ*. Our French contemporary points out that manufactures which appear the most simple are often the most complex and difficult to conduct; and this fact can be realized by a visit to an oxygen factory. Apart from any intricacies there may be in the manufacture, it seems perfectly obvious, from the information given in the first paragraph of this article, that the small private plant could not compete in cost with the large plant, even with compressing, cylinders, and transport added. The requirement for oxygen in carbonization and complete gasification would therefore have to be on a fairly considerable scale to justify an independent plant on the gas-works. Our French contemporary says: "We do not believe that there is "any advantage, either from the point of view of practicability or economy, in production by the user, except "perhaps under special conditions, when the consumption "is large—reaching, for example, 600 to 800 cubic metres "per day." We should imagine, from the costs we have quoted for the 2 million and 3 million oxygen-producing plants, that the 600 to 800 cubic metres per day is pitching the paying capacity of such a plant for gas-works purposes at too low a level. Our French contemporary says that what is required, for economical production and practical need, is the multiplication of district oxygen-producing factories, and not the multiplication of small private plants. It is in the former direction that there would have to be development, in order to realize economy, if the fascinating efficiencies in gas production (as portrayed by Prof. Cobb and Mr. Hodsman) are to be the good fortune of gas-works generally.

### Who is Mr. C. K. S. Hills?

It will be seen from our "Correspondence" columns that Mr. Tully denies all knowledge of the letters which were signed by "C. K. S. Hills," and were sent to a number of newspapers; and he states that he took immediate steps to contradict them. His letter shows that he is a strong believer in the retention of carbon monoxide in town gas supplies. The question as to who is "C. K. S. Hills" remains unanswered.

### Audi Alteram Partem.

This is a useful aphorism to keep well in mind. At the time our editorial comments were written on the recent meeting of the Society of British Gas Industries, the report of the business proceedings had not been read. Had it then been available, there would have been some modification of the references to Lord Riddell's remarks as to the inefficient condition of the old gas appliances which he had in the country house he occupies, but which have been replaced by more efficient ones since he made a public complaint regarding them. We had no knowledge as to the location of the house to which Lord Riddell alluded. Had there been that knowledge, we should have been well aware that there was some explanation as to the long continuance in service of the inefficient appliances of which complaint was made. As a matter of fact, various ineffectual attempts had been made by the Gas Company concerned to obtain instructions to replace the appliances. This fact may not, at the time, have come to Lord Riddell's notice, owing to the unusual circumstances. Mr. Cyril G. Davis, in proposing at the meeting of the Society a vote of thanks to Lord Riddell for his address, remarked that he did not think it could be said that gas concerns were behind the times. In fact, "the particular Gas Company to which Lord Riddell had referred were very up-to-date, with men as keen on pushing gas and gas appliances as were any men in the country." That statement, applied to the Company in question, was well-deserved. The business methods of all gas companies are not open to censure.

### Ammoniacal Liquor and Railway Rates.

Many small gas undertakings have to run their ammoniacal liquor to waste (this sometimes causes trouble with the local authorities) owing to the prohibitive cost of conveying the liquor by rail to a distiller's plant where it can be worked up. It is thus that such undertakings lose money, and the railway companies the traffic. The National Gas Council have taken up the matter; but one of the railway companies considers that, to grant a lower rate for this traffic would constitute an "undue preference." Nothing therefore has resulted, other than the slight concession under the recent general reduction in railway rates; but this is not sufficient to have any really beneficial effect. However, it is understood that the National Gas Council are going to continue to press for further relief in this connection. Until there is relief, we are afraid that the ammoniacal liquor produced by many small undertakings will have to be regarded as a waste product. There is no encouragement to them to do anything useful with it in present circumstances.

### Coal Mining Agreement.

The delegates of the Miners' Federation will have a delicate matter to consider at their meeting at Blackpool to-day. The principal topic for discussion will be the wage position, and the question of giving three months' notice to terminate the existing

national agreement, which is on a profit-sharing basis. It is understood that South Wales, Scotland, Lancashire, and Durham are favourable to terminating the agreement; while Yorkshire, Northumberland, and other districts do not wish to end it, but regard as far preferable the more moderate course of securing amendment, so as to provide an improved wage. Authorities think it is unlikely that the conference will decide to give immediate notice of termination, but that a ballot of the coal-fields will be taken.

### Coal Exports.

In the month of April, the quantity of coal exported was 6,841,423 tons, which was an abatement of 338,679 tons on the amount sent abroad during March. The figure for April, 1922, was 4,096,578 tons; and in the opening month of the great coal stoppage in 1921, only 606,548 tons were exported. The value of the coal exports last month was £8,914,748; for the same month of 1922, £[illegible]6,455; and for that of 1921, £1,309,817. The gas coal exported in April figured at 728,353 tons, as compared with 480,855 tons in the corresponding month of 1922, and 91,037 tons in that of 1921. The values were respectively £902,276, £644,742, and £201,313. The average value per ton of the gas coal shipped last month was £1 4s. 9·3d. In March the average value was £1 3s. 11·7d. In the four months ended April this year, 3,019,143 tons of gas coal were exported, compared with 2,456,321 tons in the corresponding period of 1922, and 941,805 tons in that of 1921. The values were respectively £3,536,135, £2,726,820, and £2,433,040.

### Gas Coke Exports.

The quantity of gas coke shipped in April was 87,885 tons, compared with 43,540 tons in the same month of 1922, and 28,631 tons in that of 1921. The values in the three periods were £138,043, £64,361, and £62,685. The average value per ton last month was £1 11s. 4·9d. In the four months of this year, 382,438 tons of gas coke were shipped, which figure contrasts well with the exports in the corresponding periods of 1922 and 1921—viz., 269,608 tons and 200,342 tons. The values in the three periods were: 1923, £566,984; 1922, £409,407; and 1921, £531,571.

### Sulphate of Ammonia Shipments.

The quantity of sulphate of ammonia sent abroad during last month was 13,681 tons, as against 8951 tons in April, 1922. In the past four months, 78,019 tons were exported, compared with 50,424 tons in the corresponding period of 1922.

### Norfolk Shale Retorting and Desulphurization.

The distillation of shale in Scotland has been practised with practical and commercial success. But what suits Scottish shale, will not suit the shales of Norfolk. This was early recognized by English Oil-Fields, Ltd.; and during the past six-and-a-half years, exploration has been proceeding, and large sums of money have been spent, in experimental work in order to find a retort which would negotiate the shales of Norfolk with such a success as to bring fortune to the shareholders, who have long since almost despaired of anything satisfactory materializing. Through the life of the Company, attempts have been made to buoy-up those who invested their money in the concern, by glowing accounts of an approaching success in the retorting of the shale, and the refining and desulphurizing of the oil products. But the problems are problems still. The annual meeting of the shareholders has recently been held; and the new Chairman of the reconstructed Board (Mr. W. Guy-Pell) stated how he realized, when he accepted office, that the Company were in a desperate position. He also mentioned that something like twenty different retorts have been tried without success. It was said at the previous meeting that the much-lauded Turner retort had overcome the sulphur difficulty; but it was subsequently found that the oil contained the same quantities of sulphur. Now the Company are trying the "Fusion" retort, which is asserted to be efficient, economical, and easily operated, while by far the cheapest to instal. With regard to desulphurizing and refining, the Board have had a number of processes under consideration, but not one has proved commercially successful. At one time there was no market for oil containing a large percentage of sulphur; but the Chairman asserts that they are now finding possible uses for oil where sulphur, instead of being a disadvantage, is, on the contrary, an advantage. That market must be limited, as the uses to which sulphurous oil can be put are few. Nevertheless, the Chairman says that contracts are now pending for the purchase of large quantities of sulphurous oil at a price considerably in advance of ordinary non-sulphurous oil. We take it that the use to which this oil will be put will be for steam-raising, though many engineers are averse to exposing their boilers to a fuel of high sulphur content. Certainly no one would use such oil in an internal combustion engine. The assertions of a time ago as to the wonderful quantity of shale—2000 million tons—on the Company's properties, and to the 30 to 60 gallons of oil per ton, appear to have been more mythical than real.

### The Building Trade Award.

This is a matter in which the gas industry is interested from two points of view. In the first place, the industry at this time of year has in the aggregate a fairly considerable amount of building work in hand; and, in the second place, as suppliers of gas and coke, the more houses that are built, the better their field for business activity. But we are afraid the reduction of wages that has been made in the building trade by the recent award will not have any material effect in stimulating building. The wages of grade "A" craftsmen (with the exception of London) and grade "B" craftsmen have been lowered by 1d. per hour; those of London area craftsmen by ½d. per hour, which also is the general reduction in the case of grade "C" craftsmen. Labourers' wages are to be maintained at as nearly as possible 75 p.ct. of the craftsmen's wages. Apparently, too, adjustment of wages is in future to be made on the cost-of-living figures only; and the law of supply and demand is not to be a determining factor.

## PERSONAL.

Mr. F. GORMAN, Deputy-Engineer to the South Suburban Gas Company, was successful in the recent final examinations for the Assoc.M.Inst.C.E.

We understand that Mr. T. SETTLE, of Leeds, has severed his connection with Moore's Gas-Generator Syndicate, Ltd., No. 1, Upper Woburn Place, W.C. 1.

Mr. E. B. TULLY, who for the last fifteen months has been representing in Japan the interests of Tully Gas Plants, Ltd., of Millgate, Newark-on-Trent, and London, is at present touring in China, with a view to obtaining information as to the fuel resources of that country and their applicability to modern gas making and power production.

Referring to the fact that the Council of the Society of Chemical Industry have this year awarded the Society's medal to Dr. CHARLES CARPENTER, C.B.E., President of the South Metropolitan Gas Company, in recognition of his distinguished services to chemical industry, the official "Journal" of the Society states that Dr. Carpenter became a member in 1893. He became associated in 1914 with the late Lord Moulton in an endeavour to re-establish the dye industry in England. The supply of high explosives, however, becoming of supreme importance, he was appointed a member of the High Explosives Committee, where he was acknowledged by Lord Moulton to have been one of his most valued colleagues. He was also a member of the Munitions Inventions Department, of the Chemical Inventions Committee, and of the Nitrogen Products Committee. He was President of the Society of Chemical Industry during the important stages of the war from 1915 to 1917, during which time, jointly with Dr. Rée, of Manchester, and Dr. Alexander Scott, of London, he was instrumental in forming the Association of British Chemical Manufacturers, of which he became the first Chairman. Throughout the whole of his professional career he has been an ardent advocate of the closest co-operation between the engineer and chemist.

## OBITUARY.

We are sorry to learn that Mr. GEORGE WINSTANLEY, of Messrs. Winstanley & Co., Murdoch Works, King's Norton, Birmingham, died on May 21.

We regret to have to announce the death, on the 22nd inst., at his residence, "Yattonfield," Leyland Road, Southport, of Mr. S. W. TAMPLIN, Managing Director of Messrs. Donald Macpherson & Co., Ltd. Mr. Tamplin was well known to gas engineers, though on account of ill-health during the last few years he has not been among them so much. He was always cheery and bright, and will be missed by all who knew him.

# ELECTRICITY SUPPLY MEMORANDA.

Some folks have singular notions as to the causes of the reductions that have lately been made in the charges for gas. There is nothing mysterious or abnormal about them. Nevertheless, we have found them attributed to all sorts of reasons other than the correct ones. The higher gas accounts campaign in the newspapers has been cited as a cause, notwithstanding that it has been shown that neither the aggregate consumption of gas, nor the aggregate revenue of any undertaking disclosed an increase of more than normal amount, which was proof positive that there had been no rise in gas accounts generally. We have also heard the reductions attributed to the competition of electricity; but the margin of advantage on the side of gas in the way of economy is so great that, if this was the real reason, there would have been no need to make reductions in the way they have been effected. One might just as well assert, and with better reason and more truth, that the reductions that have been made in the charges for electricity are largely due to the competition of gas. The Sunderland Gas Company have recently lowered the price of their gas by 3d. per 1000 c.ft., making it 2s. 3d. There is nothing remarkable about the Company doing this, and so continuing to take one of the leading places in the country in respect of low price. To occupy such a position is nothing new for the Company. A low price, consistent with ability to sell at it, has ever been their policy. But a member of the Town Council lately developed the theory that the energy of the Electricity Department in extending its scope and efficiency was the "direct cause" of the reduction in the price of gas. Electrical people who hold such opinions might exercise their intelligence a bit, and look beyond the boundary of their own affairs, to ascertain whether there are not other influences at work to account for gas price reductions. Perhaps they would find at least three: First, as economic circumstances change, so must the price of gas. The costs of materials and labour having fallen, the costs of production have followed suit; and so people have a right to expect that the price of the product will pursue the same downward line. Gas administrations are not so foolish as to adopt a course of self-destruction by maintaining unjustifiable prices. The second cause exercises a long and strong pull upon the majority of statutory gas concerns. It is the sliding-scale of prices and dividends—an instrument of adjustment as between share or stock holder and consumer of which the electricity industry cannot boast. The price of gas has to come down before dividends can go up; and as the price of gas ascends, dividends decline. Furthermore, gas undertakings want to have a larger place in the system of things; and cheaper gas is a way to this. Perhaps if those electrical people who think electricity competition has so much influence upon the price of gas will consider these points, they will have grounds for reflecting upon the childish innocence of their previously cherished and expressed opinions.

**The Cause of Gas Price Reductions.**

Those householders who are foolish or prodigal enough to desire an all-electric house had better be extremely careful in their selection of an electrical adviser. The competitions in the "Electrician," and observations outside them, induce us to give this word of advice. There are two reasons for it. The first is that electricians have such diametrically opposite notions as to the character of a suitable installation. One counsels something that means a considerable outlay; and another, prompted by the necessity for economy, advises something that is going to make the householder and his family miserable for the whole of the days that they are condemned to live with the installation recommended and (let us suppose) adopted. It is proof of his fidelity to his client when the man consulted rather over-estimates practical requirement in the way of light and heat than under-estimates it. We are not going to say whether or not the competitors in the "Electrician" under or over planned for the class of house which they set out to treat. But the fact remains that the winning competitor presents a scheme which he computes will cost £117, while the third prize-winner's figure is just about double (£235)—the second prize winner coming (as shown last week) close to the latter with £222. If we were asked to express an opinion on this point, we should be inclined to say that the greater satisfaction for the householder, after he had discharged the heavy installation bill, would be found in the second or the third scheme. The judges of the competitors' work had some criticisms to make. They said the competitors failed to grasp this essential of the competition—an all-electric house is not one filled with electric appliances, in the same way as a showroom. The competitors might retort that an all-electric house is not one in which everything required in the way of light and heat is not provided electrically. The word "all" precludes any partial treatment. It was found, too, that the important factor of cost was often neglected. It appears that the plan of the house chosen for the competition was what one might in these times call a £1500 house. Our contemporary says that sometimes the inadequate figure of 3 p.ct. on the cost of the structure is laid down for the electrical installation. On £1500, 3 p.ct. is only £45; and £45 would not go far in providing the wiring and its accessories, lamps, and cooking, heating, and hot-water appliances for a £1500 house. None of the competitors' figures is as low as this. If they had been, they would probably have been ruled-out on the score of fraudulent misrepresentation. The costs for the winning scheme work-out to 7·8 p.ct. on the £1500; those of the third prize-winner, to 15·66 p.ct. Our contemporary entertains the pious desire to make electricity in the home popular, and not the preserve of the ultra-rich. It is not going to succeed in this, with installation costs running to anything like 15·66 p.ct. extra on a £1500 structure.

**Installation Costs.**

Just a little examination of the first and third schemes. Regarding the former, we must candidly say that we do not like the evidence of the sacrifice of appearance to economy, albeit the scheme is to cost £117. Some items are too finely cut to be of the best. Now what has a house costing £1500 got to do with living-room fittings which only cost 19s. each (and though there are two, the total price appears at 19s., instead of 38s.), or a dining-room fitting which costs merely £1 3s. 3d., or a hall fitting which costs 16s. 6d., or a loggia fitting which costs 7s. 6d.? One cannot in these days obtain at such prices electric fittings which look good and are good. The manufacturers produce them because there is the demand for them; the manufacturers also turn out goods far more tasteful in appearance, and far more durable; but they charge—and must charge—higher prices for them. However, electrical costs insist that with electrical operation there must be, to make as good an economical showing as possible, the utmost paring-down of costs. A table lamp is shown to cost 10s.; we would not give a table lamp of the kind to our least-loved friend, either as a birthday or a wedding present. All the bedroom fittings are nothing more than lengths of flexible with a lamp swinging at the end. They are not bad for the purpose; but there is something cheap-looking about them. The first prize-winner is frank. He says: "In the case of fittings, rigid economy has been observed; and only glassware has been supplied upstairs. It is believed that this arrangement frequently gives the greatest satisfaction. If expensive fittings are installed in the first place, the consumer frequently wishes to change his mind at a later date when he has had experience of the electric light; but he then does not feel inclined to scrap a valuable fitting." In other words, the fittings embraced in this £117 scheme are more or less experimental; and it is anticipated that supplementary cost will come along later. The £117 is, therefore, not the final expense. The winner also says that "the greatest difficulty was with the water warming, since it is felt that an adequate supply of hot water is of primary importance. The housewife will have it in her power to economize in this direction by means of the control board supplied." If we were to be condemned to a so-called "all-electric" house, we would sooner have the third prize-winner's scheme than that of the first-prize winner. There is something about the former which creates a greater confidence that it would provide appearance and comfort, without saying anything as to running costs. The style of the fittings is altogether better; and more light and heat are apparently in contemplation, though in all conditions of weather in such a house we should not like to be limited to the heat supplied by 1·5 watt per hour per cubic foot capacity of the living and dining rooms, and under 1·5 watt in the larger bedrooms.

**Installation Costs and Satisfaction—or Otherwise.**

What, however, is the value of competitions of this kind? The principal value apparently lies in the advertisement which the promoting journal gets. But the competitions do not attract the men most qualified to prepare such schemes. The judges say: "Frankly, the results obtained were disappointing, and cannot be taken as representing the best brains of the electric wiring industry." And further: "In all schemes for the internal wiring of buildings, the first cost should be looked upon as one of prime importance; and therefore it is necessary when formulating a scheme that the cost of all materials and apparatus shall be carefully considered, *not only at their purchased price, but also at their fixed price.* It is interesting to note in this connection that, ignoring the cost of apparatus, the prize-winning scheme cost £60 19s. 4d. for 33 points. The second prize-winner reached £100 5s. 5d. for 35 points; and the third prize-winner £88 16s. 1d. for 45 points—altogether too large a number for so small a house."

**Judges' Criticisms.**

In dwellings equipped with gas-pipes, the electrical people have great difficulty nowadays in persuading the tenants to discard those pipes, and substitute wiring. They find they have largely reached saturation level in respect of easy conversion. Therefore, means have to be devised for persuading people to change over. One great obstacle is the initial cost of effecting the change. At East Ham, the Electrical Engineer has proposed a scheme for wiring on the deferred payment system. It is interesting for gas men to keep in touch with these projects for assisting expansion of the electricity business. The proposals of the Engineer have resulted in the Electricity Supply Committee submitting these recommendations to the Council: (*a*) That the following terms and conditions be adopted for the wiring of private premises for electricity supply under agreement for the purchase of the installation on a system of deferred payments, the work to be carried out by contractors on behalf of the Council: Example based on

**Deferred Payment Scheme for Wiring.**

a £10 installation (each installation to be based *pro rata* on cost). First payment of £2 10s. (or 25 p.ct.) due on signing agreement; repayments of the balance to commence from the next quarter thereafter. Balance spread over one year in four equal quarterly instalments of £2 0s. 6d., total cost to the consumer, £10 12s.; two years in eight equal quarterly instalments of £1 1s. 8d., total cost to the consumer £11 3s. 4d.; three years in twelve equal quarterly instalments of 15s. 4d., total cost to consumer, £11 14s.; four years in sixteen equal quarterly instalments of 12s. 3d., total cost to consumer, £12 6s. (*b*) That the question of raising the money be referred to the Finance and General Purposes Committee with a view to the sum of £2000 being appropriated from the prospective surplus profits of the undertaking in respect of the year ended March 31 for making a trial of the scheme. An expenditure of £10 will not go far in providing an electrical installation, and there are not many local authorities who would be prepared to relinquish hold of £2000 which might be devoted to the relief of the rates, but which admittedly is an altogether wrong policy.

**Electric Geysers.**

The "Electrical Times" calls attention to the "Santon" electric geyser. Our electrical friends seem to be somewhat at sea respecting the question of water heating—sometimes they are favourable to the thermal storage system, and at others the geyser type of appliance is favoured. With gas there is not the slightest question that the highest over-all efficiency lies in the geyser; but it is a case where efficiency is not the sole arbiter—convenience and distribution being also important factors. In noticing the "Santon" electric geyser, our contemporary makes these points: "From the consumer's point of view the geyser system of water heating has much to recommend it. The efficiency of this class of apparatus is the highest obtainable, being close on 100 p.ct.; hot water is always on tap; and units consumed and paid for are in direct proportion to the quantity of hot water used. Given satisfactory appliances in each case, the thermal storage system of water heating can only be a successful alternative to the electric geyser where special 'heat accumulation' tariffs are available. Which system is the better to take care of all the varied domestic requirements is a matter on which opinions differ; and it still awaits final decision." In the "Santon" electric geyser, we read, the water is heated by a bare element actually immersed in the water. Troubles experienced in the past—unavoidable leakage of current to earth through the water, and the formation of scale on the heating resistance—have been the cause of many failures. But the former difficulty, it is understood, has been overcome in the new type of geyser by the simple expedient of making the body of the apparatus of an insulating material. Moreover, our contemporary explains, "channels are provided through which the water passes; the running water being thus forced to take a path of comparatively great length and small sectional area. These channels of water being interposed between the actual resistance element and those parts which are earthed, offer an insulation resistance of the order of 10,000 to 15,000 ohms. The water passes through a wad of aluminium gauze in the spout, which is provided with a terminal for connection to earth; and, when so connected, there is not the slightest possibility of shock." Our contemporary is informed that "even in the event of the earth wire being carelessly left off, only a slight shock is felt, owing to the previously mentioned water-channel resistance. As to internal scaling, this, it is stated, is not experienced. In actual use any scale formed on the spiral cracks-off when the coating is complete, and is easily washed away. "The elements which necessarily operate at a low temperature should last for years even with constant use. When necessary, however, new spirals can be fitted in a few minutes even by an inexperienced person. The standard elements are wound for 5 KW., and are suitable for supply pressures of 200-250 volts. Special voltages can, of course, be provided for; and elements wound for 7 or 8 KW. are available, and are to be recommended where the supply authorities will permit." The production of electric geysers is manifestly not quite so simple a matter as the making of gas-geysers.

**Pennsylvania Public Service Information Committee.**—Under the chairmanship of Mr. P. H. Gadsden (Vice-President of the United Gas Improvement Company, Philadelphia), there has been organized the Pennsylvania Public Service Information Committee, at No. 930, City Centre Building, Philadelphia—the object being "the timely assembling and dissemination of reliable information relating to the Commonwealth's public utilities." The Committee include representatives of gas, water, electric light and power, and electric railway companies. According to Mr. Gadsden, the purpose of the Committee is primarily educational. Within the last few years, the rapid development of public utilities along practical lines has rendered this necessary. The Committee are, in fact, a State bureau created to supply to the public, through the Press and otherwise, accurate information concerning the public utilities of Pennsylvania, with the view of crystallizing sound opinion and a feeling on the part of the public which will promote clear understanding of these utilities. The magnitude of the investment represented in such essential services in Pennsylvania, together with their vital relationship with industry generally in the State, and the effect of a proper understanding of public utility problems on the solution of economic problems, emphasize the importance of comprehensive co-operation.

## "FIELD'S ANALYSIS" FOR 1922.*

WE have been permitted a view of the issue of "Field's Analysis" for the year 1922, which is now ready for publication. On this occasion there are no new or additional features to record; nor are any further alterations required, judging by the excellent reception given to the previous edition on every hand, as indicated (we understand) by the increased sales.

In any statistical work dealing with the gas industry, one's thoughts naturally centre more and more round the new method of charge, and its consequent adaptation as a basis upon which working results should be gauged. The process of transition from the old system to the new has not yet been fully accomplished; and the volumetric basis still holds sway even in some of the well-known undertakings. But gradually and inevitably all gas officials must learn—and, in fact, they are learning—to think in therms, despite a certain amount of prejudice in some cases and in other cases a certain fondness for, and easy familiarity with, the "per 1000 c.ft." of other days. The therm results shown in the Analysis will, we are sure, be perused with the interest that should be accorded them.

Turning to the detailed figures of the statistics, it is observed that, in the main, an atmosphere of well-being pervades the aspect, as perhaps was to have been expected. Lower prices of gas, increased dividends, and reserves on a more substantial footing, all indicate the successful year and the turning of the tide after a sequence of years characterized by leanness and hard struggling. The chief reason for this is to be found on referring to the page showing some of the important items for 1922, as compared with the four previous years. Taking the cost of "Coal," expressed for obvious reasons on the basis of 1000 c.ft., we observe the remarkable difference shown in Table I.

TABLE I.—*Cost of Coal per* 1000 *C.Ft. of Gas Sold.*

| Year. | The Gas Light. | Commercial | South Metropolitan. | All Metropolitan Companies. | Suburban Companies. | Provincial Companies. | Dublin Company. | Provincial Corporations. | Scottish Corporations. |
|---|---|---|---|---|---|---|---|---|---|
| | d. | d. | d | d. | d. | d. | d. | d. | d. |
| 1918 | 33·37 | 34·10 | 37 24 | 34·59 | 32·26 | 27·67 | 42·69 | 22·49 | 24·54 |
| 1919 | 37·38 | 31·96 | 40 57 | 37·85 | 36·01 | 31·52 | 44·26 | 26 00 | 29·12 |
| 1920 | 44·08 | 38·45 | 43·78 | 43·55 | 42 84 | 39·10 | 47·86 | 29·90 | 36·40 |
| 1921 | 40·93 | 41·62 | 42·92 | 41 57 | 42 27 | 38·32 | 49 33 | 37·97 | 43·70 |
| 1922 | 27 39 | 28 92 | 31 17 | 28 59 | 31·29 | 25·93 | 37·37 | 35·13 | 40·47 |

As a natural sequence to this, Table II. shows how the charge for capital—due of course in the case of the companies to increased dividends—has risen.

TABLE II.

| Year. | The Gas Light. | Commercial. | South Metropolitan. | All Metropolitan Companies. | Suburban Companies. | Provincial Companies. | Dublin Company. | Provincial Corporations | Scottish Corporations. |
|---|---|---|---|---|---|---|---|---|---|
| | d. | d. | d. | d. | d. | d. | d. | d. | d. |
| 1918 | 8·36 | 6·53 | 6·10 | 7·53 | 5·83 | 5·24 | 10·55 | 3·04 | 3·22 |
| 1919 | 7·13 | 5·73 | 5·77 | 6·64 | 5·26 | 5·29 | 11·12 | 3·20 | 3·38 |
| 1920 | 6·84 | 5 35 | 7·99 | 7·05 | 4·99 | 5 05 | 10·94 | 3·29 | 3·33 |
| 1921 | 10·11 | 7·94 | 7·86 | 9·28 | 7·59 | 6·31 | 12·40 | 3·36 | 3·38 |
| 1922 | 10·36 | 9·59 | 8·31 | 9·71 | 8·26 | 7 15 | 16·84 | 3·94 | 4·76 |

The sales of gas are on the whole very satisfactory; 23 undertakings out of the 35 dealt with showing increases—in one case to the extent of nearly 14 p.ct.

It is interesting at this stage to compare the figures given in the Analysis with those of twenty years ago. Since 1902 we find that the Metropolitan Companies have experienced an increase in the number of consumers of 111 p.ct., the Suburban Companies 160 p.ct., and the Provincial Companies 107 p.ct.; the three groups together showing an increase of 118 p.ct.

During the same period the number of consumers per mile of main has increased in the Metropolis from 195 to 320, or 64 p.ct. In the suburbs they have increased from 126 to 209, or 66 p.ct.; and in the provinces from 129 to 182, or 41 p.ct.

If progress is measured by the quantity of gas made during 1922 as compared with 1902, we get in the Metropolis 55,038 million cubic feet, as against 37,532 millions—an increase of nearly 47 p.ct. In the suburbs 18,588 millions were made as compared with 8650 millions, an increase of 115 p.ct. In the provinces, 20,680 millions were made, against 12,463 millions—an increase of 66 p.ct. The three groups together give a total of 94,306 millions for 1922, and 58,645 millions for 1902—an increase of nearly 61 p.ct. All these figures are very remarkable.

Although the number of undertakings dealt with in the Analysis—viz., 35—is relatively small, their make of gas amounts to the colossal figure of 143,471 millions, over 56 p.ct. of the total gas produced by all the authorized undertakings in Great Britain and Ireland.

Another interesting fact obtained from the Analysis is that the average calorific value of the gas declared by the undertakings

* "Field's Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland, and Ireland for 1922." London: Eden Fisher & Co., Ltd. Price £2 2s.

included in the work is now approximately 470 B.Th.U., and the average value of the gas supplied some 10 or 11 B.Th.U. above this figure. During the year 1922, the declared calorific value of five of the Companies was raised; the average increase being 27 points. It is observed that some of the undertakings record a difference of as many as 15 or even 20 B.Th.U. between the declared and supplied calorific values of their gas—a fact which may lead us to suppose that further increases in the declared values may follow in due course. The supply of gas of a calorific value in excess of the declared is, of course, to a small extent necessary in practice; and the margin for safety will vary with different undertakings. It is naturally unwise to work to any extent above the safety margin, as the price of gas thereby must inevitably and unnecessarily be increased. In the case, for instance, of an undertaking supplying 1000 million c.ft. per annum, a difference of 10 points above the safety margin would at 10d. per therm involve a sum of as much as £4000 in a year.

Three undertakings—viz., Brentford, Rochester, and Belfast—exceeded their previous maximum day's output during the year.

Once more it is our pleasure to congratulate Mr. H. E. Ibbs, the Accountant to the Gas Light and Coke Company, upon the valuable information—quantitatively and qualitatively—he has placed between the well-known red covers of this recognized standard work. The information we have extracted from the new issue, or by comparison with previous ones, only touches the fringe of the contents. Interest in the Analysis, instead of diminishing, grows year by year, and will still do so as long as the gas industry continues to progress, technically and commercially, in the manner it is doing in these times.

## THE CALL FOR CHEAP BUT EFFICIENT BURNERS.

It will be remembered that at the annual meeting of the Institution of Gas Engineers held in Dublin, in June, 1907, Mr. Harold E. Copp read a paper on "Incandescent Gas Lighting, with Special Reference to Inverted Burners." Mr. Copp described and criticized in scientific detail the most popular burners then in use, and stated how necessary it was that those who were responsible for the welfare of the industry should be in a position to recommend to consumers the best burners for the practical purpose for which they were required. He also stated that it would not be denied that numbers of incandescent burners had been placed on the market which must have had an injurious effect on the industry. The "Journal of Gas Lighting," in commenting on the paper, pointed out that the President of the meeting (Mr. Charles Hunt) insisted in his address that what was wanted, in conjunction with the low price of gas, was cheap, simple, and effective appliances. "We are afraid," the "Journal" went on to say, "that all the makers of these appliances have not done so much as they might have done to blend science with their practice in manufacture; and, on the other hand, gas engineers have not exercised themselves so much as they might have done in such research."

Unfortunately, this cry fell on unheeding ears. The fact that gas at that time was generally of a high and uniform standard—tested for illuminating power, and not for calorific value—may have had something to do with the apparent lethargy in this respect. However that may be, the general tendency in recent years to supply gas of a lower quality than formerly, necessitating a watchful eye on, and adjustment of, appliances, together with the passing of the Gas Regulation Act, 1920, imposing on gas undertakings subject to the Act the liability to see that all appliances are adjusted to burn the gas supplied to the best efficiency, has made the subject one of the greatest importance; and the matter may be said to have been brought to a head by the reading by Dr. Charles Carpenter, the President of the South Metropolitan Gas Company, of a paper in June, 1922, before the Institution of Gas Engineers, entitled "Some Gas-Burners and a Moral."

### Cheap and Nasty Burners.

Dr. Carpenter's paper was devoted more particularly to a description of the "Metro" burner—a scientifically made burner manufactured specially to suit the high calorific power gas supplied by his Company. Speaking generally of the development of gas-burners, Dr. Carpenter appealed for a wider appreciation of the science of burner design. He said that much of the production and marketing of these essential appliances "had passed into the hands of shoddy manufacturers and unscrupulous agents, who had no more interest in the article they made or sold than the profit it brought them." Dr. Carpenter went on to say that the gas industry had devised no test for fittings, with the result that "shoddy" makes, which should have been relegated to the scrap heap or to the melting-pot, were distributed far and wide all over the country. "These cheap and nasty burners and fittings constitute a menace, the seriousness of which is hardly realized. In construction they are bad, and in use they are inefficient and unsatisfactory. The stability of the business of gas undertakings is seriously imperilled by the dissemination of such rubbish; and the time has passed when it could be treated with indifference. Nearly thirty years ago one of the most cultured men who has occupied the Presidential Chair of this important industry uttered these words of warning: There was a tendency among gas engineers to concentrate attention upon the larger matters of their profession, and to overlook the small ones; but it was often the latter which largely determined the success or failure of their business. . . . Gas engineers might feel proud when they regarded a large gasholder containing 12 or 13 million c.ft. of gas; but if they were to look more carefully into the smaller matters—such as gas-burner construction, and the suitability of gas appliances for consumers' use—they would find that these were of vital importance to the success of their business."

The following are extracts from the speeches of certain members made during the discussion following the reading of Dr. Carpenter's paper. Mr. J. Ferguson Bell: "I venture to hope that the result of this paper will be that in any of the showrooms which we enter we shall never see inefficient burners and inefficient fittings, but English goods of the best quality. If we are going to expect manufacturers to supply us with a good article, we must expect to pay a reasonable price." Mr. H. E. Copp: "I have been perfectly amazed at the small amount of progress made in the construction of burners, with the exception, of course, of that made by Dr. Carpenter. I much question whether the burners obtainable to-day are any better than those of ten years ago. I am referring particularly to the type of burner fitted with adjustment." Mr. C. F. Botley stated, in regard to the loss in lighting load in Hastings, that the conclusions he had come to were "first that the competition of these abnormally shoddy burners is a very serious one indeed, and it is a very difficult thing to stop; and, secondly, that we want something to compete with these particular burners—a good burner at a very low cost." Mr. W. J. Liberty: "If nothing other than the elimination of the shoddy stuff which is put on the market is the outcome of the paper, then Dr. Carpenter can go away feeling that he has done the Institution a great service."

### Action Taken.

If the cry of 1907 proved unavailing, the shout of 1922 had almost immediate effect. In reply to a letter written by Mr. W. J. Liberty, in July, 1922, to the Technical Press, on Dr. Carpenter's paper, the Secretary of the British Commercial Gas Association (Mr. J. C. Walker) stated that some time previously a Joint Committee was set up by that Association (of six representatives each of the Association and of the Lighting Section of the Society of British Gas Industries), to consider what steps could be taken (*a*) towards the standardization of the essential parts of burners, (*b*) towards the elimination of shoddy burners, mantles, and fittings from the market, and (*c*) towards the maintenance and development of gas lighting; and that it was hoped that a report would be ready for presentation at the Association's annual conference at Bristol, in October. This report is still unpublished, but a recent announcement in the Technical Press states that a specification of a standard inverted burner has been agreed upon.

Having regard to the fact that all the well-known manufacturers of gas-burners are represented on this Committee, it should not be difficult for them to agree upon the standardization of essential parts of a burner. The question of vital importance to the gas industry, however, is what will be the all-round standard of efficiency of the burner when made-up from the recommended standardized parts.

### The Work of Burners (1921) Ltd.—The "Efficient" Series.

A tale of words; now to tell a tale of action. During the summer of 1921, Burners, Ltd., manufacturers of gas-burners and gas surrounds, at Stoke Prior Mills, Bromsgrove (Worcs.), having fallen a victim to the then prevailing economic conditions, the present proprietors entered into negotiations for taking over the property and business. In due course terms were agreed with the Liquidator; and in October, 1921 (some months, be it noted, before the reading of Dr. Carpenter's paper) Burners (1921) Ltd., came into being. The aim of the Company is to manufacture burners of high standard, and supply them at as moderate a price as possible, eliminating in the manufacture all material that might be regarded as shoddy and inefficient.

Immediately on taking over the business, the watchword "Efficiency First" was adopted; and, at the risk of losing the market of 1922, no time or expense was spared in fully equipping the factory with modern plant and machinery. In August, 1922, the Company placed its "Efficient" series on the market; and testimony from users of these burners shows that the Company's initial standard is a satisfactory one.

The introduction of the screw air collar (not hitherto universally adopted on domestic lamps), with insulated operating attachment, the armoured disc, and the venturi-type bunsen tube cut from the solid rod, are a few of the novelties of the "Efficient" series—making for increased efficiency—which have particularly attracted gas engineers. Moreover, all the essential parts of the series are standardized and interchangeable, and all the parts are of British manufacture.

### The Results of Independent Tests.

The following are particulars of independent tests of the burners, made by Messrs. Alexander Wright & Co., Ltd., of Westminster, which speak for themselves:

*Burners (1921) Ltd.*

Dear Sir,—Following instructions received from you, we have tested for candle power the four burners submitted by you, all of which were adjusted by your Mr. Burgoyne; and we append the results obtained.

The calorific value of the gas was 503 B.Th.U. per c.ft., and the pressure at which the burners were tested 3 in. water gauge. The

barometer was 30·01 in. and the temperature 60° Fahr. The gas consumption was corrected to N.T.P.

*The Standard "B" Burner—1 Mantle.*

Corrected consumption of gas, 4·51 c.ft. per hour.

| | |
|---|---|
| Horizontal | 62·5 candles. |
| 30° angle | 72·0 " |
| 60° " | 70·9 " |
| 90° " | 83·2 " |

*Shell Universal Standard Burner—1 Mantle.*

Corrected consumption of gas, 3·89 c.ft. per hour.

| | |
|---|---|
| Horizontal | 70·0 candles. |
| 30° angle | 76·5 " |
| 60° " | 70·3 " |
| 90° " | 84·05 " |

*Triple Superheated Burner—3 Bijou Mantles.*

Corrected consumption of gas, 4·28 c.ft. per hour.

| | |
|---|---|
| Horizontal | 70·0 candles. |
| 30° angle | 91·5 " |
| 60° " | 104·0 " |
| 90° " | 91·5 " |

*Aluminium Burner—1 Mantle.*

Corrected consumption of gas, 3·75 c.ft. per hour.

| | |
|---|---|
| Horizontal | 67·5 candles. |
| 30° angle | 73·7 " |
| 60° " | 77·1 " |
| 90° " | 80·0 " |

Yours faithfully,
(Signed) ALEX. WRIGHT & CO., LTD.

In due course it is the intention of the Company to turn their attention to the manufacture of fittings, in which it is agreed there is a large scope for improvement. Already the Company have on the market a type of slot-pendant of seamless tubing, with a specially devised gas-cock, giving fullest protection to the consumer against leakage of gas. There is no doubt that the old-fashioned type of seamed tubing will have to be scrapped, and all future fittings made of seamless tubing, with a thoroughly efficient gas-cock so designed as to render impossible any accidental turning-on.

## Coal-Tar Fuel for Engines.

Mr. Wilbert J. Huff, of the Koppers Company Laboratories, Mellon Institute, Pittsburgh, has contributed to "Industrial and Engineering Chemistry" a lengthy account of recent accomplishments bearing upon the use of coal tar as a fuel for internal-combustion engines. He remarks that coal-tar distillates consist chiefly of aromatic hydrocarbons of the ring type, of high stability and low hydrogen content. They yield an oil gas only at comparatively high temperatures, and then relatively slowly, and, of course, give much less hydrogen than do the paraffin oils. Consequently, they have a high ignition temperature (480° C., as against 260° C. for the gas from petroleum oil). Thus, an engine which starts readily with paraffin oil, and which remains in operation under low load conditions, may not start at all with coal-tar oil; or, if in operation, may stop when lower compressions reduce the temperature of the cylinder. This difficulty is specially important with small engines, which radiate their heat rapidly. To overcome combustion troubles, the usual practice is to utilize a petroleum oil for the primary ignition. Crude tars can generally be obtained at about half the price of their distillates, and therefore the use of tars as a fuel for Diesel engines has been given some study. Horizontal and inclined retort and coke-oven tars are generally considered unsatisfactory fuels; but tars from intermittent and continuous vertical retorts are relatively much less viscous, contain less free carbon, yield less coke, and are much richer in aliphatic compounds. Such tars can be used direct without difficulty—especially if an auxiliary ignition oil is used. The valuable properties of vertical-retort tars result from the low temperature under which they are distilled from the coal. Low-temperature tar, lignite and peat tars, and oil-gas tars are likewise suitable for use in the Diesel engine direct. The economic recovery of Diesel fuel distillates, with the production of a uniform grade of pitch, can best be obtained by a process of continuous distillation. A continuous still has recently been developed which is very suitable for this purpose; and among the desirable features which the design appears to present, he mentions the following: (1) Heat is applied upon vertical surfaces only, thereby eliminating high temperatures at points which may be coated with insulating solids deposited by the heated tar. By eliminating "burned out" still bottoms, the life of the still should be materially increased. (2) The entire still charge is subjected to a violent thermal agitation which effectively scours loose débris from all surfaces and prevents its redeposition. This agitation also diminishes local overheating with attendant coke formation, and tends to increase the oil yield and diminish the pitch yield. (3) The ratio of heat-transfer surface to the volume of the still is very large, permitting high rates of distillation with small installations, and without exposing large volumes of tar to the heat. (4) The absence of local overheating should materially aid in fractionation. In conclusion, the author suggests for research one phase of the question which, he says, apparently remains rich in unsolved problems and poor in accomplishments—namely, the utilization of coal-tar pitches direct for the manufacture of producer gas.

## NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

### Auxiliary Section Meeting.

The eighth Auxiliary Meeting in connection with the North of England Gas Managers' Association was held last Saturday afternoon, at Ayre's Quay Gas-Works, Sunderland. Mr. W. L. ROBERTSHAW presided over about fifty members.

A letter of welcome was read from Mr. C. Dru Drury, Engineer of the Sunderland Gas Company, who said the Auxiliary Section was doing work that could not fail to benefit the Association. He pointed out that the geographical difficulties of the works site had been overcome by the resource of Mr. Robertshaw, the Works Manager at Ayre's Quay.

The CHAIRMAN gave an address, in which he said it was thirteen years since they had had the pleasure of seeing members of the North of England Association at those works. Then they saw the first intermittent vertical retort installation in England, on which Mr. Drury gave a paper in Glasgow in 1911, and for which he received the Institution Gold Medal. Mr. Robertshaw then described the works, and afterwards dealt with the question of carbonization in intermittent verticals, as carried out at the present time.

### THE AYRE'S QUAY WORKS.

The Ayre's Quay Works are the older and the smaller of the two works owned by the Sunderland Gas Company, and were erected in 1847. The plant having become obsolete, the old works were shut-down for reconstruction in the summer of 1908; and with the exception of the two existing gasholders (one of which is now used as a relief holder for water gas), the whole of the buildings and plant have since been entirely reconstructed. On the recommendation of Mr. Drury, the Directors then took the opportunity afforded them of introducing the intermittent vertical retort system of carbonization; and care was taken that the remainder of the plant should be brought up to date. The works as reconstructed were brought into use on Dec. 4, 1909.

The site of the works is irregular both in shape and levels, and only about two-thirds of the total area of the ground is available for building purposes; the level of the railway sidings, No. 1 gasholder yard, &c., being fully 50 ft. above the level of the works yard, while the site for the new holder now in course of construction is another 12 ft. higher. Owing to the small area available for coke storage in the works yard, advantage has been taken of sites 20 ft. above that level for additional coke storage. The railway sidings are in communication with the London and North Eastern Railway; and 20-ton coal wagons, after being weighed on the Company's 40-ton weighbridge, deliver their contents direct into a ferro-concrete receiving bunker which has a working capacity of three days' maximum consumption. From this large storage bunker, the coal is discharged through a bottom door into a breaker or through side doors into skips, travelled by hand, suspended from overhead runways in the coal store, by which means the store is filled. The coal thus stored is unbroken, and when required can be drawn off and passed through an independent breaker feeding into the elevator, which conveys the coal to the beds. This elevator is common to both breakers. An emergency arrangement is provided for handling the coal in case either the breakers or the elevator should fail.

The coal handling and arrangements for elevating the coke and breeze to the hoppers over the bench are so designed that the whole of this work (when carbonizing the maximum amount) is easily done by yard men in about six hours per day.

### THE INTERMITTENT VERTICAL RETORTS.

The installation of vertical retorts at the Ayre's Quay Works consists of nine beds of ten retorts each, set in two parallel rows of fives. Each retort is 4 metres (13 ft. 1½ in.) long, the section being rectangular, with rounded corners 9 in. by 22½ in. at the top, tapering to 13¾ in. by 27¼ in. at the bottom. With twelve-hour charges, the installation is capable of carbonizing 615 tons per week; but allowing for retorts laid-off for scurfing, the capacity is reduced to 600 tons per week, or 85½ tons per day, from which, with the aid of steaming, a daily average make of 1,100,000 c.ft. is obtained. The ground space occupied by the bench is 145 ft. by 17 ft. 6 in., or 3150 sq. ft., which is equal to 2·1 sq. ft. per 1000 c.ft. of gas made.

In the original setting moulded retorts were used; and, with the exception of the lower halves of the retorts and the brickwork in the combustion chamber (which were of Stettiner material), British material of British workmanship was employed in the construction of the whole of the bench. Experiments have been made with various materials; and the British material used has a high percentage of silica. The lower halves of the retorts are now built in tongued and grooved segmental bricks, as this type keeps its shape better under working conditions when strongly heated, and is more easily repaired.

In the original installation, the gear for discharging the retorts was operated by hand; but in the later installation hydraulic power has been introduced for this purpose. When the plant is working at its full capacity, three stokers per eight-hour shift do the whole of the work connected with the installation, fill and clinker the producers, regulate the steam supply to the retorts sweep-up, &c.

The coal, after being discharged from the railway wagons into the ferro-concrete receiving hopper, is fed into a breaker, whence it is elevated into a receiving hopper fixed above the overhead hoppers and central between the benches. From this hopper the coal is drawn off into a small side-tipping truck running on rails laid on the top of the continuous hoppers, and by this means these hoppers are filled. The travelling hand-charging machine can take coal at any point from the overhead hoppers, as it is supported on rails running the whole length of the installation. By pulling a lever, the charging machine is filled with coal from one of the numerous doors on the underside of these hoppers. Before charging the retorts with coal, a small quantity of breeze, about 1 cwt., is introduced into each retort by means of a special duplex breeze charger, which measures the charge on the shot punch principle. This breeze is introduced into the retort in order to fill-up the space immediately above the charging door, and to bring the coal itself within the carbonizing zone of heat. On discharging the retorts, this breeze is automatically screened out of the coke as it passes up the inclined portion of the hot-coke conveyor.

After the retorts have been breezed, the spouts of the coal charger are lowered into them. A pair of hinged shoots fixed to the charger is then lowered on to these spouts, which direct the charges into the retorts. The shoots are then lifted and the spouts withdrawn; the coal left in the spouts, when the shoots are removed, being sufficient to fill the retorts to the correct level —about 26 in. below the cast-iron moutbpiece facing. The top doors are now closed, and gas is given off, which passes into the hydraulic main through horizontal off-take pipes, provided with self-sealing doors for cleaning purposes. These off take pipes are cleaned on alternate days by pushing a steel disc attached to a rod through them, when the tar inside the pipes is in a soft condition. There is one off-take pipe to each retort. We work with unsealed dips in the hydraulic main except when discharging the retorts.

We have worked eleven-hour charges, giving the maximum production; but we have adopted a twelve-hour charge as best suited to our requirements. This charge includes four hours intermittent steaming—*i.e.*, seventh and eighth, and eleventh and twelfth hours—at 5 or 6 lbs. per sq. in. pressure through a $\frac{3}{16}$-in. hole. This steaming gives us great elasticity in the make and quality, and also increases the ammonia yield. When the water-gas plant is shut down, we adopt a thirteen-hour charge with intermittent (total five hours) steaming, which keeps the composition of the gas about the same as if the water-gas plant was working; the extra water gas being made (by means of steam) in the retorts, instead of in the water-gas generator.

At the end of the carbonizing period the dips are sealed in the hydraulic main, and the top doors opened. The bottom doors are then opened in pairs by hydraulic power, and the hot coke glides out down the hot-coke shoot on to the conveyor. In the conveyor the coke is automatically quenched as it travels along, and is screened and delivered either into hoppers or into bogies, and transferred to the high-level coke storage ground, so as to be ready for quick loading for shipment. Coke for feeding the producers and breeze for the retorts are elevated to the hoppers fixed over the beds by means of an electric hoist, which can also be used for coal should the elevator break down. On such an occasion, the coal would be drawn from emergency shoots from the coal store previously mentioned.

### Description of Heating of Setting.

Each setting has a separate producer, which is built the full height of the bench, having a sealed feeding door at the top, and a step-bar grate with double clinkering doors at the ground floor level. Clinkering is reduced to a minimum. Coke is fed to the producers by a travelling shoot filled from the overhead hoppers. The regenerators are arranged on each side of the producers, and are formed of three vertical passages—two for waste gases, and one for secondary air—which are constructed of special tiles to ensure the maximum heating of the secondary air, and the absence of any short circuiting or by-passing. The waste gases enter the regenerator at the top; and the secondary air, coming in at the bottom, passes upwards between the waste gas flues into a chamber at the top of the setting, where it is split up and conducted to the combustion chambers, which are arranged at the bottom of the retorts.

The combustion chambers are placed between the retorts; and there are control dampers for secondary air, furnace gas, and waste gases respectively, so arranged that the supply can be regulated in each combustion chamber. The flame can be extended or set back to suit requirements by altering the lengths of the horse-shoe shaped nozzle bricks; and every point in the setting is under independent control. The temperature of any part of a retort can be adjusted without the slightest interference with the general heating of the setting.

The retort setting is carried on a platform of cast-iron plates about 8 ft. above the floor level, to allow of the coke being discharged underneath. The retorts have flanges moulded on them, carrying tiles at different levels, so arranged as to regulate the flow of the heating gases, which circulate upwards in a zig-zag fashion from the combustion chambers at the bottom of the setting to the waste-gas outlets at the top. Dampers are provided in various parts of the setting which enable control of the heat to any chamber; each retort having a combustion chamber on each side of it.

Special attention has been paid to the control of the heating of the settings; the average temperatures maintained being:

| | |
|---|---|
| Combustion chamber, highest heat zone . | 1325° C. = 2420° Fahr. |
| Middle chamber, medium heat zone . . | 1170° C. = 2140° Fahr. |
| Third chamber, lowest heat zone . . . | 1120° C. = 2050° Fahr. |

Standard working conditions have been reached in the control of dampers and air slides; and the settings will run for several months with practically no alteration to air slides or dampers, and maintain regular combustion, equal diffusion, and uniformity of temperature in the several heat zones during this period.

### Working Results.

The figures given in Mr. Drury's paper of 1911 have been constantly maintained, and though we have got improved results in make per ton, the therms have remained the same—70 to 75, according to working conditions and the class of coal carbonized.

I have figures before me of results obtained in intermittent verticals with Wharncliffe Silkstone coal at the Truro Gas-Works in May, 1918, which give a yield of 85 therms per ton, and this of 503 B.Th.U. gas. The results were obtained by means of downward steaming, as invented by Mr. Thomas Settle (Settle's patent). This being the case, I fail to see the great advantage claimed by the continuous system; and I would like to see further developments on this downward steaming process. One great advantage of the intermittent vertical retort system is that you see the inside of the retorts every time they are discharged; and this advantage is one that must not be lost sight of.

Details of the life of the Sunderland vertical settings and of the repairs carried out during their life are set out in the following table.

*Beds Nos.* 4, 5, 6 (*Typical Examples*).

| Days at Work. | Repairs, &c. |
|---|---|
| 566 | Producer relined and cracks in retorts filled and pointed. |
| 1130 | Producers relined and cracks in retorts filled and pointed. |
| 1st Life 1468 | Producers relined and retorts reset. Let down for resetting |
| 652 | Producers relined and cracks in retorts filled and pointed. |
| 1384 | Producers relined and back retorts at combustion-chamber level repaired. |
| 2nd Life 1993 | Let down for re-setting. |

You will thus see that the total repairs to vertical settings during their life consist in the renewal of part of the producer lining at the clinkering line at periods of about 600 to 700 days; the cracks in the retorts being filled and pointed at similar periods. Repairs to the back retorts are necessary at about the combustion-chamber level when they are 1300 days old, this being due to the cutting action of the flame round the bottom of these retorts. We now aim at a working life of about 2000 days (or 2000 tons per retort).

### Coke Loading.

We have a rather unique way of dealing with coke which has to be delivered into railway trucks. Previous to 1920, the whole of the coke put on rail had to be delivered into trucks at Millfield Station (a mile away) by carts or motor wagons. It was a most expensive and unsatisfactory arrangement; and no scheme had then been devised which would have enabled us to do it any more cheaply, owing to the high capital cost involved. However, it was found that when the coal-gas plant was worked up to its full capacity, something had to be done to find a quick outlet for the extra amount of coke made; and, after looking into several methods of coke handling, we came to the conclusion that the only way to do it at a reasonable cost was to arrange to load up the coke into coal wagons as we emptied them, by means of an electric transporter. This method has proved quite satisfactory.

A telpherage scheme was considered for this purpose; but the high capital cost put it out of consideration for the amount of material which has to be handled. The repairs to the transporter are very moderate. During the 2½ years it has been in use, it has handled over 10,000 tons of coke, and the repairs are under ½d. per ton of coke handled. The repairs include three new ropes and the upkeep of skips, &c. For safety we renew the ropes on every 3000 tons handled, though they would probably lift twice that amount if we were prepared to take the risk.

We fill self-trimming coke skips, holding approximately 1 ton, from the coke-storage hoppers. These skips are pushed along a 24-in gauge light railway for 70 yards by hand. At right angles to this, but 70 ft. above it, is fixed the transporter track. This track passes over and above the empty coal trucks. The transporter arrangement is operated by a man placed in a cabin above the level of the coal trucks, whence he can see the light railway and the trucks to be filled. By means of a suitable lifting bale, which is hooked on to the trunnions fixed on the ends of the coke skips, the latter are lifted from their carriages, a height of 60 ft., through the roof of the retort-house, and then travelled horizontally above the trucks, when a catch is released and the coke deposited in the trucks. By this means we are able with five men to fill 100 tons of coke per normal working day, and at the same time teem the coal contained in the trucks. This is treble the amount we ever put on rail in the same time at Millfield Station with the accommodation provided there by the railway company. This transporter has proved invaluable; and since it

# WOODALL-DUCKHAM VERTICAL RETORTS

FIRST IN 1903 — FOREMOST IN 1923

The WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO.(1920) LTD.

## 146 PLANTS ERECTED OR ON ORDER

TOTAL CAPACITY— 16,817 TONS PER DAY

### ORDERS RECEIVED SINCE 1ST JANUARY, 1919

| | CAPACITY Tons per day |
|---|---|
| *Dundee, Scotland (2nd Installation) | 110 |
| *Brechin „ | 21 |
| *Newton-in-Makerfield, England (Extension) | 21 |
| *Dunfermline, Scotland | 110 |
| *Lochgelly, „ | 21 |
| *Ripon, England | 40 |
| *Walsall, „ | 100 |
| *Kilsyth, Scotland | 24 |
| *Inverness, „ | 40 |
| *Bergen, Norway (2nd Installation) | 57 |
| *Stockport, England | 168 |
| *Glasgow, Scotland | 1,356 |
| *Adelaide, Australia | 80 |
| *Portsea Island, England (2nd Installation) | 140 |
| *Carnoustie, Scotland | 21 |
| *Wexford, Ireland | 18 |
| *London, G. L. & C. Co. (4th Installation) Kensal Green | 200 |
| *Neath, Wales | 60 |
| *Bolton, England (2nd Installation) | 168 |
| *Workington, England (Extension) | 23 |
| *Stourbridge, England | 80 |
| *Wolverhampton, England | 80 |
| *Troon, Scotland | 28 |
| *Trondhjem, Norway (2nd Installation) | 38 |
| *Carried forward* | 3,004 |

| | CAPACITY Tons per day |
|---|---|
| *Brought forward* | 3,004 |
| *Warrington, England | 112 |
| *Manchester, „ | 336 |
| *Kirkcaldy, Scotland | 88 |
| *Wallasey, England (2nd Installation) | 120 |
| *Lanark, Scotland | 21 |
| *Gourock, „ | 28 |
| *Brighton, Australia | 60 |
| *Fremantle, „ | 20 |
| *Christchurch, New Zealand | 40 |
| *Wanganui, „ (2nd Installation) | 40 |
| Perth, Australia | 60 |
| *Birmingham (7th Installation) Nechells | 840 |
| *Sheffield, England | 336 |
| *Dairen, S. Manchuria | 100 |
| *Paisley, Scotland | 140 |
| Hinckley, England | 60 |
| Dresden, Germany (3rd Installation) | 180 |
| Cheltenham, England | 120 |
| Market Harborough, England | 26 |
| Leatherhead, England | 40 |
| The Hague, Holland | 168 |
| Liverpool, England | 100 |
| Paris, France | 420 |
| Geelong, Australia | 60 |
| TOTAL CAPACITY Tons per day | 6,519 |

* *In Operation*

*For all particulars apply to*

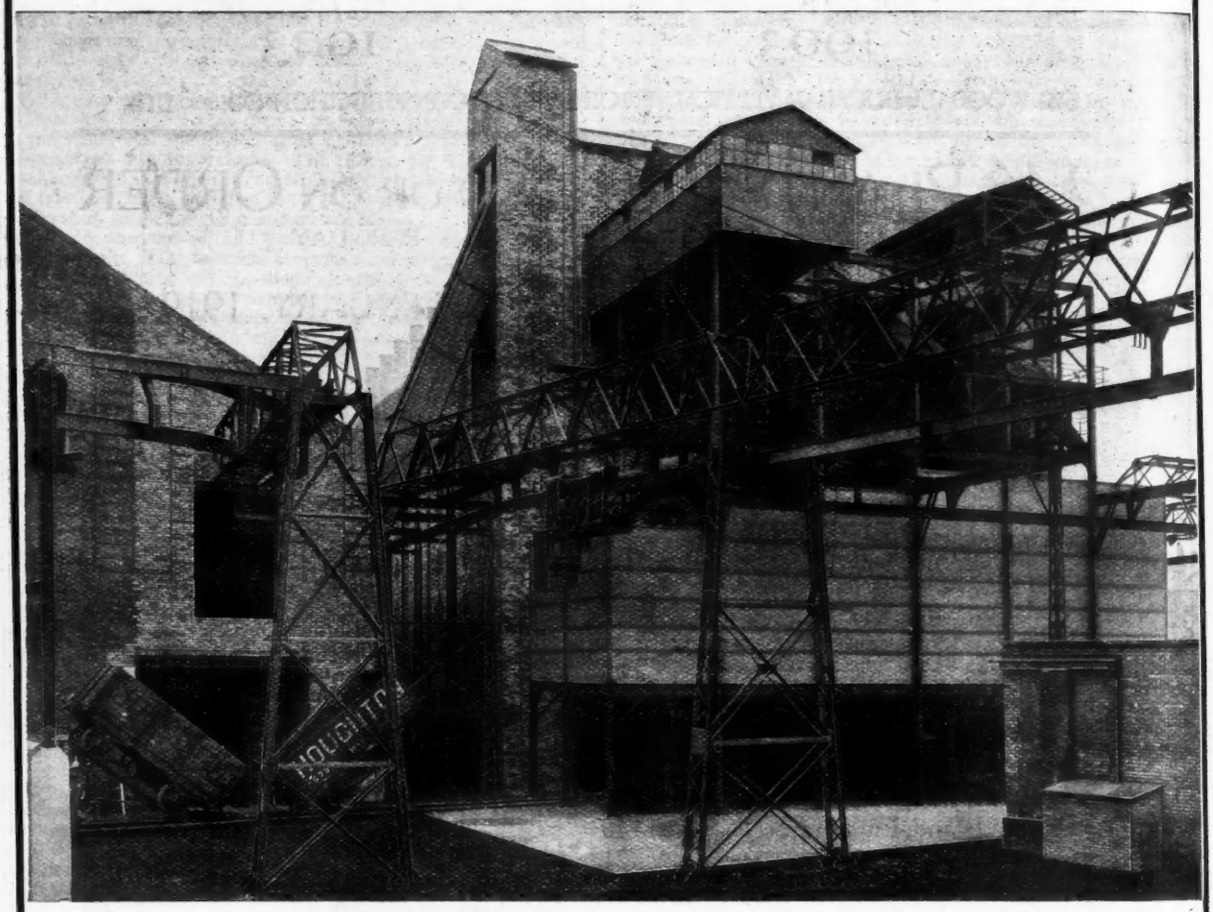
## The WOODALL DUCKHAM CO.

**Head Office:** 52 GROSVENOR GARDENS, S.W. 1.

*Telephone* 9272 VICTORIA — *Telegrams* RETORTICAL : : SOWEST

**Manchester District Office:** Lloyds Bank Buildings, King Street, Manchester.

# "DEMPSTER-TOOGOOD" SYSTEM OF (STEAMED) CONTINUOUS VERTICAL RETORTS



## LEEDS (MEADOW LANE GAS-WORKS).

**2,500,000** CU. FT. PER DAY.

**10,000** TONS AUTOMATIC COAL-STORES.

**550** „ COKE STORAGE IN ELEVATED PATENT NON-CORROSIVE BUNKERS IN 4½" BRICKWORK.

**100** TONS PER HR. COAL HANDLING PLANT.

**50** „ COKE „ AND SCREENING PLANT.

PATENT MONO-RAIL TELPHERAGE FOR HANDLING COAL FROM STORES OR SURPLUS COKE TO YARD.

# ROBERT DEMPSTER & SONS, LTD.,

## ELLAND.

Wire: "DEMPSTER," ELLAND.

'Phone: ELLAND 261. PRIVATE BRANCH EXCHANGE.

has been installed, it has been used for the following purposes other than coke loading:

(1) Spent oxide loading into trucks.
(2) Lifting retorts and material for re-setting to top of bench.
(3) Coke to overhead hoppers for producers and water-gas plant when hoist is being overhauled.
(4) Transporting coal from store to No. 1 breaker during coal strike.
(5) In case of elevator breakdown, can be used for lifting coal to overhead hoppers over beds.
(6) Used for lowering goods received by rail into lower yard.

MR. THOMAS SETTLE ON DOWNWARD STEAMING.

Mr. T. SETTLE (Leeds) said he could bear out the particulars and data given by the Chairman with regard to the setting at Sunderland. He had had a good deal to do with the question of standardization of areas, air supplies, and temperature in relation to general working conditions. After persevering with those settings in different ranges—eighteens, tens, eights, and fours—it was found that (say) 54 in. of primary for a bed of eighteen, with 1·5-10ths for primary; 48 in. for secondary, with 2-10ths of an inch; and 120 in. for bench dampers on the setting side, with 4-10ths of an inch, gave absolutely balanced working conditions. At one large works they kept a couple of bricklayers putting in Seger cones, and chemists taking temperatures every other day. The balance arrangements did away with all that, and the Seger cones had not been seen since. It was easy to find anything that went wrong, but from one end to the other they had hardly any difference between one zone and another. He could endorse the Chairman's remarks on the standardized working of the particular type of setting described; and the great advantage was that one could see through the retort every time it was discharged, and it enabled one to learn if the course was clear for another charge.

Mr. Settle, in dealing with downward steaming in gas-works, put the following figures forward, as demonstrating steaming methods:

*Intermittent Carbonization.*

Tests of 260 tons of coal (Yorks. and Lancs.).

| — | Gas. | Calorific Value. | Therms. | Combustibles. | Non-Combustible. |
|---|---|---|---|---|---|
| | C.Ft. | | | P.Ct. | P.Ct. |
| No steam . . . | 14,440 | 498 | 72·0 | 82·1 | 17·9 |
| Up steam . . . | 16,500 | 476 | 78·5 | 82·2 | 17·8 |
| Down steam . . | 17,212 | 491 | 84·5 | 85·3 | 14·7 |

*Increases.*

| | P.Ct. |
|---|---|
| Volume up steam over no steam . . . . | 14·26 |
| Heat value " " " " . . . . | 9·0 |
| Volume down steam,, " " . . . . | 19·19 |
| Heat value down steam over no steam . . . | 17·3 |
| Volume down steam over up steam . . . . | 4·3 |
| Heat value down steam over up steam . . . | 7·0 |
| Coke— | |
| No steam. . . . . | 64·24 p.ct. |
| Up steam . . . . . | 62·5 " |
| Down steam. . . . . | 62 0 " |
| Tar— | |
| No steam . . . . . | 15·22 gallons. |
| Up steam . . . . . | 15·26 " |
| Down steam. . . . . | 14 37 " |
| Ammoniacal liquor (10 oz.). | |
| No steam . . . . . | 31·5 gallons. |
| Up steam . . . . . | 38·0 " |
| Down steam. . . . . | 39·7 " |

*Temperature—Gas.*

Hydraulic main.

| | |
|---|---|
| Up steam (average) . . . . . | 110°C. |
| Down steam " . . . . . | 60°C. |

*Steam.*

| | |
|---|---|
| Temperature (average) . . . . . | 300° Fahr. |
| Pressure . . . . . | 10 lbs. to 30 lbs. per sq. in. |
| Steam nozzles . . . . . | ⅛ to ⅜ in. diameter. |

*Temperature—Settings.*

Down steaming.

| | |
|---|---|
| Combustion chambers . . . . . | 1325° C. |
| Middle chambers. . . . . | 1168° C. |
| Top chambers. . . . . | 1120° C. |

*Water Gas.*

| | Combustibles. | Incombustibles. |
|---|---|---|
| Down steaming . . | 92 6 p.ct. .. | 7·40 p.ct. |
| Calorific value—observed . | 315·0 B.Th.U. per c.ft. | |
| " " calculated . | 316·4 " " " | |

Mr. Settle said that the downward-steaming practice had not had the attention he would have liked, owing to illness; but he was hoping more would be done in that regard, as he was sure there was a great deal in it. It was a following-up of the retort of twenty years ago, with which he had been connected. It was a following-up of conditions which they proved at Exeter, and hoped to see fully realized. There was more to do yet, not only with the intermittent systems, but with all systems. There was still more left to do than had been accomplished.

Mr. WILLIAM GALLEWAY (Whitby) moved a vote of thanks to the Chairman for his address. Many of them, in perusing their technical journals, had wondered how it was that Sunderland were reducing their gas charges so considerably; but he rather thought they were being let into the secret. In thanking the Chairman, he coupled with his name that of Mr. Dru Drury, for his kindness in placing the works at their disposal.

Mr. J. E. DIXON (Elswick) seconded the vote, which was heartily carried.

Mr. ROBERTSHAW, responding, said it had been a very great pleasure to him to see so many attend the meeting; and he appreciated the way in which his paper had been received.

After the meeting, the members were shown round the works by Mr. Robertshaw and Mr. A. H. Bagshaw (Works Manager of the Hendon Gas-Works).

## EASTERN DISTRICT EXECUTIVE BOARD OF THE NATIONAL GAS COUNCIL,

### AND COMMITTEE OF THE FEDERATION OF GAS EMPLOYERS.

The Annual Meeting of the Eastern District Executive Board was held at No. 30, Grosvenor Gardens, London, on May 16, under the chairmanship of Mr. Thomas Glover, Norwich.

The minutes of the previous meeting were read and confirmed; and the annual report and statement of accounts were adopted.

It was announced that, owing to the exigencies of business, Mr. E. H. Parker, M.A., D.L., J.P., the Chairman of the Cambridge Gas Company, was unable to offer himself for re-election as Chairman of the Board; and a resolution was passed unanimously thanking him for his services, which had been of great value, especially in the initial stages of the formation of the Council. Mr. Thomas Glover, Norwich, was elected Chairman for the ensuing year, and Mr. J. W. Auchterlonie, Cambridge, Vice-Chairman.

The Management Committee was constituted as follows: Messrs. T. Glover, Norwich; J. W. Auchterlonie, Cambridge; W. H. Mainwaring, Lincoln; F. M. Paternoster, Felixstowe; P. D. Walmsley, Great Yarmouth; J. S. Dougall, Boston; Frank Prentice, Ipswich; J. R. Bradshaw, Retford; J. B. Hansford, Bedford; J. H. Troughton, Newmarket; H. G. Ruggles, Leighton Buzzard; W. W. Townsend, Colchester.

Mr. Thomas Glover was re-elected as one of the representatives on the Central Executive Board.

Mr. W. W. Townsend was thanked for his services, and was re-appointed District Secretary for the ensuing year; and Mr. Thomas Glover was re-appointed as the District's representative on the Central Emergency Committee.

Mr. S. S. Ogilvie, Joint Manager of the National Gas Council, was present, and explained the steps which had been, and are being, taken by the Council in connection with precautionary measures in the distribution of gas, electrical competition, the therm inquiry, and the new Gas Amending Order under the Gas Regulation Act. He also explained the position of gas undertakings in regard to diversions and alterations of mains rendered necessary by road improvements.

The annual meeting of the District Committee of the Federation of Gas Employers followed. The annual report and statement of accounts having been adopted, Mr. Frank Prentice, Ipswich, was re-elected as Chairman, and Mr. J. W. Auchterlonie, Cambridge, was elected Vice-Chairman.

The following representatives were elected to the Management Committee: Messrs. Frank Prentice, Ipswich; J. W. Auchterlonie, Cambridge; W. H. Mainwaring, Lincoln; P. D. Walmsley, Great Yarmouth; J. H. Troughton, Newmarket; F. M. Paternoster, Felixstowe; J. R. Bradshaw, Retford; H. G. Ruggles, Leighton Buzzard; Thomas Glover, Norwich; F. A. West, Newark; J. B. Hansford, Bedford; W. W. Townsend, Colchester.

Mr. J. H. Troughton was re-elected as one of the representatives of the District on the Central Committee, and Mr. W. W. Townsend was again elected as Secretary.

Mr. Frank Prentice was appointed as the representative of the District on the Central Emergency Committee.

A discussion followed on matters of current interest, in the course of which Mr. Ogilvie, who was thanked for attending, gave some interesting information.

**Scottish Junior Gas Association (Eastern District).**—Saturday, June 16, is the date fixed for the annual excursion, which is to be to St. Andrews. Here the members will have an opportunity of inspecting the gas-works, and will afterwards be entertained at luncheon. In the afternoon, it is proposed to hold a golf competition.

**Railway Station Lighting.**—The current issue of "A Thousand-and-One Uses for Gas," (No. 111) contains reproductions of some attractive night photographs taken of railway stations which are really well illuminated. In the majority of these stations use is being made of the low-pressure superheated cluster incandescent gas-lamp. It is to be hoped that before long the railway authorities will see their way to give the public the benefit of these new gas-lamps in their stations throughout the kingdom, and thus help on in a fresh field the admirable "Safety First" movement. Copies of the publication can be obtained from the British Commercial Gas Association, No. 30, Grosvenor Gardens, S.W.

# THE HERBERT PENDULUM HARDNESS TESTER.

### Its Use in the Workshops of Gas Undertakings.

The hardness of the tools in general use in engineering workshops is of great importance. The unsatisfactory results obtained from tools which have not been correctly heat-treated, make essential some knowledge of the hardness of the tool. A tool which is too hard will break if at all overloaded; and a tool too soft will not stand up to its work.

The new tester provides a method of obtaining the hardness of tools, which, while highly satisfactory, is not so expensive in the first cost as the other alternatives. Consequently it is of special interest in the case of small repair shops such as are found in many gas undertakings, where knowledge is required as to the hardness of the tools used.

There is another use to which the instrument can be put. As is explained later, there exists a definite and simple relationship between the pendulum test scale and the Brinell scale, and a constant relationship holds between the Brinell hardness number and the ultimate strength of the material tested. This is capable of wide application in the case of structural steel. As an example, if we take a steel having a Brinell hardness of 173, which corresponds to a Herbert time-test hardness of 24, the ultimate strength would be $0{\cdot}355 \times 173 = 61{\cdot}5$ kilogrammes per sq. mm.

The "Herbert Pendulum Hardness Tester" is a new instrument which tests the hardness of substances ranging from lead to sapphire, and is particularly applicable to hardened steels. The

instrument is extremely simple, as also is the principle on which it is based; which latter depends on the impression made by a small steel ball on the substance under test. A ball, 1 mm. in diameter, is held in a chuck in the centre of the instrument, and six screwed weights are provided whereby the position of the centre of gravity of the whole instrument may be adjusted to coincide with the centre of the millimetre ball. It is made in two weights, 2 kilogrammes and 4 kilogrammes respectively, their dimensions being identical. The ball is of ruby or of steel. Immediately above the ball is a graduated weight mounted on a screw. By raising or lowering this weight, the centre of gravity of the instrument can be brought to a predetermined distance above or below the centre of the ball. The graduations on the weight show displacements of the centre of gravity in hundredths of a millimetre. A curved tube and bubble, and a scale graduated from 0 to 100, are fixed at the top of the instrument. The centre of gravity being at the centre of the ball, the instrument is in neutral equilibrium when supported by the ball on a hard level surface; and it tends to remain in any position in which it may be placed, whether upright or tilted at any angle. If the centre of gravity is below the centre of the ball, the equilibrium is stable. The instrument constitutes a pendulum oscillating about its central position; the time of oscillation being greater as the length of the pendulum (the distance between the centre of gravity and the centre of the ball) is less.

For standard tests, the length of the pendulum is $\frac{1}{10}$-mm. ('0039 in.), and the time of a single swing on a very hard surface is 10 seconds. The Pendulum Hardness Tester provides two entirely independent tests of hardness, which depend on different principles and measure different kinds of hardness. Each test has a scale of hardness numbers from 0 to 100; but the hardness numbers of a given substance are not the same on the two scales. Generally, substances are placed by the two tests in the same order of hardness; but in some cases—*e.g.*, two pieces of the same steel which have had different heat treatments, or two substances having different characteristics, such as cast iron and steel—the specimen which is shown harder by one test may be softer according to the other.

As the instrument dispenses with all microscopic measurements and all difficult readings, and as it does not depend on impact, the readings are in no way affected by the mass or inertia of the specimen. It is portable, and quick in action—a test only occupying a few seconds. Since heavy loads are not used, the test may be applied to thin and fragile articles without risk of breakage or the defacement of finished surfaces. Tests may be made, for example, on safety-razor blades.

#### Scale Tests.

If the instrument is tilted to the right until the bubble comes to zero on the scale, and is placed in that position on a very hard level surface and released, it will swing pendulum fashion; the oscillations gradually decreasing in amplitude owing to the expenditure of energy at the point of contact between the ball and the hard surface. The amplitude of the oscillations is shown by the bubble and scale. On plate glass, the bubble travels from 0 to 97 in the first oscillation.

If placed on a less hard surface such as hardened steel, with the bubble at zero, the ball will slightly indent the surface, and as the pendulum swings, the ball will roll out or elongate the indentation. The energy absorbed in thus displacing the metal is taken from the potential energy of the pendulum, and is shown by a shortening of its first swing. The position of the bubble on the scale at the end of the first swing shows the work done by the ball on the specimen and measures its hardness. In the case of a very soft specimen, the indentation will be relatively deep, and the pendulum will come to rest after a very short swing, or, as in the case of lead, will not swing at all, but remain at zero.

Typical scale test readings, using a 1 mm. steel ball, are as follows:

| | |
|---|---|
| Glass | 97 |
| Very hard carbon steel | 93 |
| Hard carbon steel | 88 |
| Tempered high-speed steel | 75 |
| Annealed high-speed steel | 64 |
| Annealed carbon steel | 41 |
| Rolled brass | 14 |
| Cast brass (soft) | 4 |
| Lead | 0 |

#### Time Tests.

The time period of oscillation of the pendulum is a very reliable measure of the hardness of the surface on which it rests, and the time in seconds taken in making 10 single swings on any substance is the "time hardness number" of that substance. Thus, the time taken in making 10 swings on glass is 100 seconds, on hardened steel 50 to 85 seconds, on soft steel 20 to 40 seconds, and on lead 3 seconds. The pendulum is placed gently on the specimen with the bubble at, or near, 50, and is caused to oscillate through a small arc. The time is taken with a stop watch. In most cases it is sufficient to time a single or double swing; but on soft substances which produce rapid oscillations, and generally for very accurate readings, the time for ten swings is taken.

The time of oscillation is, within limits, independent of the amplitude, and the limit is generally set by the instrument. If it is caused to make a long swing on a soft material it will merely settle down at the end of the swing in a new position, about which it will oscillate with the short rapid swings characteristic of that particular material.

Typical time-test readings, using a 1 mm. steel ball, are as follows:

| | |
|---|---|
| Glass | 100 |
| Very hard carbon steel | 75 |
| Hard carbon steel | 65 |
| Tempered high-speed steel | 52 |
| Annealed high-speed steel | 26 |
| Annealed carbon steel | 22 |
| Rolled brass | 15 |
| Cast brass (soft) | 11 |
| Lead | 3 |

For most purposes the time-tests are recommended. They are quickly and easily applied in laboratory or workshop, give extremely uniform and concordant results, and do not demand levelling or extreme smoothness of surface.

A useful empirical relationship between the time-test scale and the Brinell hardness scale has been established experimentally. Briefly it is this: For time-test figures below $33\frac{1}{3}$ the Brinell number is $\cdot 3T^2$; for numbers over $33\frac{1}{3}$, it is $10T$. It will be observed that $10T = \cdot 3T^2$ when $T = 33\frac{1}{3}$.

This instrument, which is the outcome of experiments extending over many years, is the invention of Mr. Edward G. Herbert, and is manufactured and sold by Messrs. Edward G. Herbert, Ltd., Atlas Works, Chapel Street, Levenshulme, Manchester.

C. N. F.

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**The German Gas Association.**—"Das Gas- und Wasserfach" announces that the sixty-fourth annual general meeting of the Association will be held this year at Eisenach towards the end of September. The exact date has still to be fixed, and full details of the proposed programme will be issued in due course.

## YORKSHIRE JUNIOR GAS ASSOCIATION.

### Visit to Wombwell Gas-Works and Mitchell Main Colliery.

A party of some sixty or seventy members of the above Association assembled at Barnsley on Saturday afternoon, May 26, on the occasion of a visit to the gas-works of the Wombwell Urban District Council—chiefly to inspect the Goodall-Clayton intermittent vertical retorts—and to the mine and coke-oven plant of the Mitchell Main Colliery.

By courtesy of the Mitchell Main Colliery Company, Ltd., the visitors were met at the railway stations at Barnsley by motor-buses, which conveyed the party to the Wombwell Gas-Works. Here they were received and welcomed by Mr. E. J. Wellens (Engineer and General Manager), in the unavoidable absence of the Chairman and members of the Gas Committee; and by Mr. C. A. Goodall, of Messrs. Goodall, Clayton & Co., of Leeds, the constructors of the vertical plant.

Mr. WELLENS said he was one of the early members of the Yorkshire Junior Gas Association. He hoped to keep in touch with the Juniors through their meetings and through visits of this character. Such visits were of great benefit, as well as a source of pleasure. The Wombwell Works were not large, but they gave good service; the plant being highly satisfactory. No doubt the most interesting feature to the visitors would be the intermittent vertical retorts erected in 1919 by Messrs. Goodall, Clayton & Co. There were, he supposed, many arguments both for and against the use of intermittent retorts; but from the day the plant had been started up till the present time, it had not been shut down at all. The undertaking was supplying gas under high pressure, in addition to its ordinary district, to 500 houses five miles away. There were two compressors and receivers; and they compressed the gas to 40 to 50 lbs. into the receivers, and distributed it at 5 to 8 lbs. per sq. in. pressure. The plant included a tar-dehydration equipment; 90 p.ct. of the tar being sold as dehydrated.

Mr. C. A. GOODALL said he was very glad to welcome them, particularly as he had not been able to be present when the Association, a few weeks before, had visited the works of his co-partners, Messrs. Clayton, at Leeds. He hoped the members would inspect the intermittent retorts as closely as they desired, and ask any questions. The firm had not yet acquired a long list of places where they could show intermittent plants; but there was a great deal to be said for the system, especially on smaller works. The notable features were its simplicity and adaptability.

The visitors then inspected the plant, where they were shown the charging and discharging of the retorts; the charge being from 16½ cwts. to 1 ton. The total capacity of the plant is 500,000 c.ft. per day. Details were explained by Mr. Wellens in passing through the works. The tar plant and the engine house, which latter is to be extended, were inspected; after which the visitors were taken by motor to the Mitchell Main Colliery.

At the new offices of the Company, Mr. W. R. Wilson, the Manager, apologized for the unavoidable absence of Mr. Joseph Mitchell, the Managing Director, and offered a hearty welcome to the visitors.

In the peculiar circumstances of the occasion—for the party was to be split up and afterwards conveyed to Barnsley to catch trains—Mr. H. L. Bateman, President of the Association, asked leave to offer the thanks of the visitors to the Wombwell Gas Committee, to Mr. Wellens, to the Mitchell Main Colliery Company, and to Mr. Wilson and his colleagues who would act as guides.

A vote of thanks was formally moved by Mr. L. BATES (Sheffield), seconded by Mr. J. R. FIRTH (Bradford), and carried unanimously.

Mr. WELLENS, in a brief reply, said he wanted the members to bear in mind that though he was a Senior he was always a Junior, and was delighted to welcome them to Wombwell.

Mr. WILSON also briefly responded.

The guides to the parties were Mr. W. R. Wilson, Mr. R. Brittain, Mr. G. Hawkins, Mr. H. A. Morfley, and Mr. F. Hatswell.

The first two parties who went down the mine were fortunate in being able to stay underground for about an hour and a half. They enjoyed a thorough tour of the main roadways, engine houses, stablings, and workings, though they did not reach the present-day coal face. Owing to a little misunderstanding, however, these members missed the interesting tour of the coke-oven and bye-product plant. On the other hand, the visitors to the coking plant had an extended tour, and only a very brief trip down the pit and a short walk underground, but sufficient to be shown the wonderful equipment at and about the foot of the shaft, the underground office, methods of testing for fire-damp, and the operation of the fresh air inlet and the foul return current. The pit is 527 yds. deep, passing the old Barnsley main workings at a depth of about 300 yds.

The coke-oven plant is by Messrs. Simon, Carvés, Ltd., and comprises a setting of 45 ovens—of which 40 were erected 17 years ago and the remainder subsequently—together with tar plant, crude and rectified benzole equipment, sulphate house, laboratories, engine house, joiner's and blacksmith's shops, &c. The ovens take a charge of 8 tons; and the coking period is 36 hours.

## REFRACTORY MATERIALS SECTION OF THE CERAMIC SOCIETY.

The Spring Meeting of the Refractory Materials Section of the Ceramic Society was held in the Town Hall, Bournemouth, on May 3 and 4. In the absence of Lt.-Col. C. W. Thomas (who was too ill to attend), the chair was occupied by Mr. W. J. Gardner. After the general meeting, with which the second day's proceedings opened, the chair was taken by the new President (Mr. J. Holland). On the evening of the first day, the usual dinner brought the members and their friends together at the Grand Hotel, following a visit in the afternoon to Messrs. Pike's clay pits at Wareham. The second afternoon was taken up by visits to works at Parkstone.

The programme was so full that oral discussion was confined within narrow limits; but written discussion was invited, and will be duly submitted to the authors of papers for reply. The first item was on "The Geology of the Bournemouth District," by Mr. H. Dewey, F.G.S., of H.M. Geological Survey.

Mr. A. S. E. Ackermann, B.Sc., then delivered a highly technical, though very interesting, lecture on "The Physical Properties of Clay." It was stated that most of the work on which the author had been engaged for more than five years had been done on a small scale; but small-scale experiments on piles had been repeated on a large scale in China, and six conclusions were confirmed thereby. It was added that all natural laws are true equally on small and large scales. The special properties of clays depend largely on the fineness of their particles, but partly also on colloid material. Precipitated chalk is very fine, but has no plasticity. Coulomb is said to have shown, by means of a suspended filament of clay in his torsion balance, that clay possesses elasticity. This statement was confirmed repeatedly by the lecturer. Among the conclusions reached by him as the result of his experiments, are the following: Clay containing a definite percentage of water, and at a definite temperature, has a definite pressure of fluidity; and when this pressure is reached and maintained, the clay yields indefinitely as a dense viscous fluid, unless it is restrained from flowing or caused to rise so as to produce a statical head of clay. The pressure of fluidity is greater when the percentage of water is less, or when the temperature is lower. The tensile strength of the clay used was greater when it was raw and dry than when it was baked. Clay is elastic. The pressure of fluidity appears to be considerably reduced if the clay has once been allowed to become thoroughly air-dried, and is then wetted and puddled. Some interesting results were obtained regarding the extrusion of clay. When clay is discharged under pressure through sharp-edged circular orifices, the rate of discharge increases more rapidly than the rate of increase of pressure, and ultimately there is a phenomenon analogous to the pressure of fluidity, which has been called the critical pressure of extrusion. The discharge per sq. cm. of orifice for a given pressure is less the smaller the orifice.

Mr. G. M. Gill next read a paper on "The Use of Refractory Materials in Gas-Works," an abstract of which appears on p. 540. The author finally predicted that there is bound to be a growing demand for fire-resisting goods guaranteed to withstand certain temperatures under definite loads, to have after-expansion or after-contraction under stated conditions not to exceed some definite amount, and to vary in dimensions only between certain stated percentages. A short discussion followed, in which most of the speakers emphasized points on which stress had been laid by the author.

Mr. W. C. Hancock, B.A., contributed a "Note on Abrasion of Fireclay Materials." This related only to simple rubbing-away of a surface, and not erosion by impingement of a stream of particles. A new apparatus for determining actual abrasion had been devised, for which several advantages are claimed. The conclusions drawn from the results of numerous experiments were such as might be expected: (1) Fine-grained firebricks resist abrasion more than those of coarser grain, and the admixture of grog, both as regards size of grain and quantity, decreases resistance to abrasion. (2) Abrasion appears to increase at higher temperatures. (3) Hard firing of bricks tends to decrease abrasion. (4) Increase of abrasion is caused by the addition of load to the wearing surfaces.

The next paper, by Dr. A. Scott, entitled "Notes on the Mineralogy of Ball Clays," was merely communicated by title; and owing to pressure of time, the remaining paper for the day was taken as read. It was by Prof. J. W. Cobb, B.Sc., and Mr. H. S. Houldsworth, M.Sc., of Leeds, on "The Behaviour of Clays, Bauxites, &c., on Heating." This was concerned with the continuation of an investigation the results of which were reported last year. The present report relates to changes in porosity, density, and refractive index. It would seem that definite changes in the kaolinite molecule, or crystal unit, as shown by changes in the specific gravity and refractive index, occurred about 450° (the temperature at which rapid dehydration began), and at 880° and 950° C. (where large shrinkages were observed, together with a rapid evolution of heat at the latter temperature). The results indicated the possibility of minor changes at 625°, 680°, and 760° C., at which temperatures kaolin exhibited very slight shrinkages. The porosities of the test-pieces increased gradually as the firing temperature of the kaolin was raised up to 1000° C. The true density of the kaolin—and pre-

sumably the bulk density and the refractive index of the kaolin crystals—had reached their minimum value when dehydration was complete.

Two papers were included in the second day's proceedings. The first was by Dr. L. M. Parsons, on "Dolomite." The modes of occurrence, characters, and composition of different types of dolomite were discussed from a scientific standpoint. The final paper was by Mr. A. F. Greaves-Walker, on "The Manufacture of Refractories in America." Generally speaking, the refractories industry has been slower in adopting mechanical devices to replace hand labour than have other industries; but in this respect the advance has been much greater than in Europe. Brief reference is made to various processes used for the manufacture of different products. For drying purposes, hot floors have largely given way to tunnel dryers heated by waste heat; and in recent years humidity dryers have come into prominence. The firing is done mainly in very large round down-draught kilns; the rectangular shape being still used in some districts. Only one works uses a continuous chambered kiln, which is fired by means of producer gas. In a few works car tunnel kilns are employed. In one instance a Dressler kiln is used with great success, the firing being carried to Cone 12. The foregoing alludes more particularly to fireclay products. For silica products, round down-draught kilns are generally used. The firing is carried to Cone 18 or Cone 20, and the firing period varies from six to twelve days. In a commercial firing, from 80 to 82 p.ct. of the quartz is inverted. A machine has been devised for making ordinary shapes. This fills the moulds, strikes off the excess, "slicks" the bricks, and dumps them in pallets. It also cleans and sands the moulds. Labour is used only to feed the pallets and take them away and place them on the dryer cars. A very small amount of power is required.

## THE USE OF REFRACTORY MATERIALS IN GAS-WORKS.

By G. M. Gill.

**[Extracts from a Paper read before the Refractory Materials Section of the Ceramic Society at Bournemouth.]**

In this country, there is a large quantity of clay, which, by natural or artificial measures, can be employed to produce refractory materials that have the disadvantages neither of fireclay nor of 95 p.ct. silica. This material—namely, semi-silica or siliceous—may even claim to be the happy medium between the two. Fireclay so frequently shows too much after contraction and too ready a tendency to soften under load; while 95 p.ct. silica material as often shows too much after-expansion, thus compelling the necessity of building in millboard, wooden strips, or of leaving spaces in the setting. Further disadvantages of 95 p.ct. silica material are that retorts have to be built up instead of moulded—an expensive alternative—while the tendency of the material to "spall" is objectionable. In the author's opinion, there is great scope for the production of a much larger quantity of semi-silica or siliceous material having a silica content varying from (say) 76 to 92 p.ct., according to the position in the setting and the purpose for which it is required. The same class of material may also be used with great advantage for producer arches and walls, and for the crowns of the arches in horizontal retort-settings.

Quite 75 p.ct. of the material required for building modern retort-settings should be of a quality showing not more than 1 p.ct. maximum expansion or contraction at 1350° to 1400° C. under load, the remaining 25 p.ct. being of a quality showing not more than 1 p.ct. maximum expansion or contraction at 1280° C. under load.

Well-made 95 p.ct. silica material of good quality should, in the author's opinion, be used in all cases for combustion-chamber arches. He would here also state that the same material, if of a uniform quality, and well and carefully manufactured, and used with considerable knowledge and experience of its peculiar properties for building retort-settings, can be employed to great advantage for such purpose. But this is a matter which really needs the combined knowledge and co-operation of manufacturer and retort-setting designer and user, to produce the best results. The author deprecates the idea sometimes put forward that there is no special difficulty in building and working successfully retort-settings of 95 p.ct. silica material. All the difficulties can undoubtedly be surmounted so long as they are recognized and handled with experience, judgment, and intelligence.

There will also be required for regenerator chambers a well-made compressed material, without cracks of any sort, and which can be safely used in pieces of 1 in. in thickness, for dividing waste-gas from secondary-air flues

As regards quality of refractory materials offered to, and used by, gas undertakings, it has often been said that the cheapest tender secures the order, and that in such circumstances there was no inducement for the manufacturer to improve the quality. There is no doubt that there is a good deal of truth in the statement of the lowest tender being accepted; but every year, largely as a result of the work of such associations as the Ceramic Society, there will be more who will employ a wise selection. It is a sounder policy to manufacture a material which finds favour with the most expert buyers, rather than a material which sells only because it is cheap. This aspect of the question is certainly becoming more recognized by both manufacturers and users.

The author would here emphasize the importance of bricks being burnt to a temperature above that at which they will be used in a retort-setting, and so obviate, to a large extent, the after-expansion or after-contraction which is otherwise likely to be experienced. There can be little doubt that bricks burnt at temperatures higher than that to be employed in the combustion chambers of retort-settings are likely to give better results than those burnt at a lower temperature.

Another matter which is deserving of continued consideration is the question of standardizing the dimensions of firebricks and blocks; as expenditure on retort-settings is materially increased by reason of the sorting and cutting of bricks which are necessary owing to the variations in size. Much waste of time is thereby caused to the bricklayers building retort-settings in picking out bricks of the same thickness to build into one course. If this trouble is not taken, as is sometimes the case, the alternative—a very objectionable one—of using a thicker joint is adopted by the bricklayer. Firework should always be built with the thinnest possible joint, and anything which is conducive to increasing this, should be avoided. It is not unusual to find bricks from the same maker varying by ¼ in. in length, width, or thickness. This points to variations in the details of manufacture, and leads one to assume that the causes of such variations may well be likely to affect in as great a degree the ability of such bricks to withstand temperature and other strains. That the dimensions of bricks do vary by the amount stated can be seen from the appended table, which the author has taken from a paper he read in January, 1922, before a Joint Meeting of the Institution of Mechanical Engineers and the Society of Chemical Industry.

Table.—*Showing the Maximum and Minimum Dimensions found by Examining Twenty-Four Firebricks (of each of two well-known makers), chosen at random from a Stack of such Bricks. The Correct Dimensions should be 9 in. by 4·5 in. by 3 in.*

| — | Length. | Breadth. | Thickness. |
|---|---|---|---|
| | Inches. | Inches. | Inches. |
| Maker (A)— | | | |
| Maximum | 9·30 | 4·56 | 3·16 |
| Minimum | 9·01 | 4·40 | 2 90 |
| Difference | 0·29 | 0·16 | 0·26 |
| Maker (B)— | | | |
| Maximum | 9·35 | 4·50 | 3·12 |
| Minimum | 8·92 | 4·27 | 2 87 |
| Difference | 0·43 | 0·23 | 0 25 |

In conclusion, the author would suggest that there is bound to be a growing demand for fire goods which bear the manufacturer's guarantee that their materials will, on testing, withstand certain temperatures under definite loads, that the after expansion or contraction under stated conditions will be less than some definite amount, and that the dimensions will vary only between certain stated percentages. This, in the author's opinion, is the step which should be taken by those manufacturers who intend to provide the gas engineer with what he will be requiring in substantially increasing quantities in the near future.

**British Association Scientific Exhibition.**—In connection with the meeting of the British Association at Liverpool from Sept. 12 to 19, it is proposed to hold a scientific exhibition, at which there will be exhibits of all the latest apparatus in connection with each section of the Association, and also exhibits showing the most recent advances in applied science. This is the first time that a comprehensive scientific exhibition has been run in connection with the British Association; and it will form a special feature of the Liverpool meeting. The exhibition will be held in the buildings of the Central Technical Schools, Byrom Street, Liverpool, which have been allocated for the purpose by the Technical Education Committee of the Liverpool Corporation. The exhibition will be open to members of the Association during the period of the meeting; but in view of the fact that it will without doubt appeal to the public interest in scientific achievement, it is intended to make the period of the exhibition from Sept. 10 to 22, and allow admittance to the public at a small charge.

**British Standard Specification No. 186-1923—Cast-Iron and Enamelled Cast-Iron Steam-Jacketed Pans.**—The British Engineering Standards Association has recently issued a specification (No. 186-1923) for cast-iron and enamelled cast-iron steam-jacketed pans, the designs for which were prepared by the Joint Committee of the British Chemical Manufacturers and the British Chemical Plant Manufacturers' Association. Tables are included in the specification which give the dimensions for pans of both shallow and deep type; the capacity of the former ranging from 26 to 100 gallons, and of the latter from 10 to 200 gallons. The tables are accompanied by complete key diagrams on which the dimensions are given. Equivalent capacities in litres are also shown for the convenience of those using metric units. The tables are preceded by clauses dealing, among other matters, with enamelling working pressures and the tests to be applied to the complete pan ready for service. Copies of the specification may be obtained from the British Engineering Standards Association, No. 28, Victoria Street, S.W., price 1s. 2d. post free.

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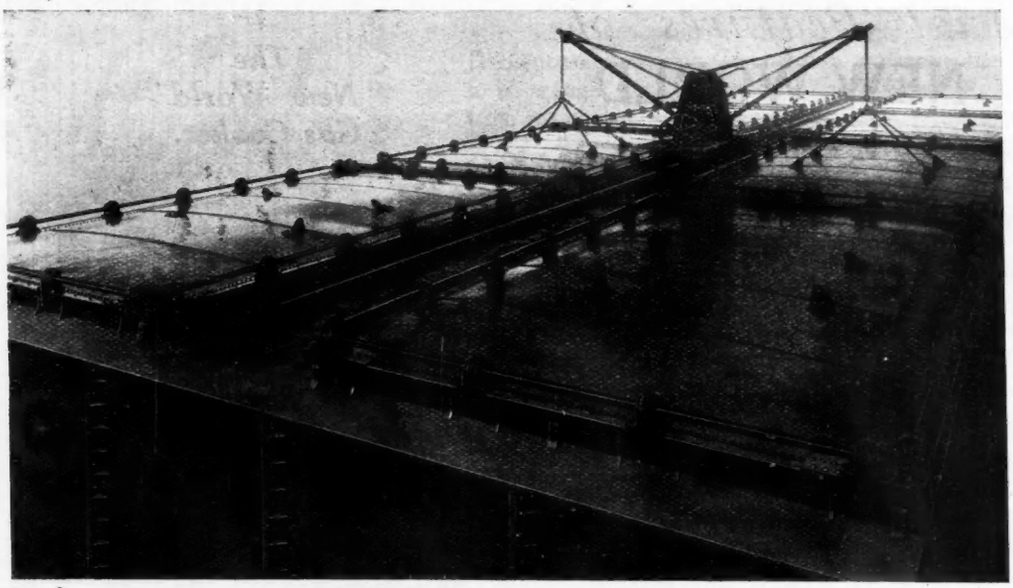

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# INDUSTRIAL LIGHTING AND THE PREVENTION OF ACCIDENTS.

Just three years ago, Mr. LEON GASTER, Hon. Secretary of the Illuminating Engineering Society, read a paper (his second) before the Royal Society of Arts on "Industrial Lighting;" and last Wednesday week he followed this up by another communication to the same Society, in which he considered the lighting of factories mainly in relation to the prevention of industrial accidents, in their broadest sense. This he prefaced by recalling briefly some of the advances that have of recent years been made in lighting. In addition to the improvements in illuminants themselves, advances in the design of reflectors—especially for industrial lighting—have also been of considerable importance, both in enabling light to be distributed more efficiently on the work, and in screening the source of light from the eye and avoiding glare.

### ACCIDENT STATISTICS.

As to the relation between industrial lighting and accidents, Mr. Gaster, on the occasion of his last paper, recalled the evidence on this point afforded in the first interim report of the Departmental Committee on Lighting in Factories and Workshops, issued in 1915. It was shown that accidents occurred most frequently during the dark winter months, and that in almost all the industries studied the accident rate by night was considerably higher than that by day; the average increase for all industries being 29 p.ct. for every form of accident, and as much as 71 p.ct. for persons falling. In the case of docks, where this type of accident is frequent, the increase was 102 p.ct. The mishaps referred to here are, of course, reported accidents occasioning bodily injury. The annual report of the Chief Inspector of Factories for 1920 shows that reported accidents in that year were 1404 fatal and 137,298 non-fatal; and it is estimated that nearly £6,000,000 was paid in this country for accident compensation under the Workmen's Compensation Act. However, the total number of accidents occasioning some degree of bodily injury, must, said the author, be far greater than this. In the first place, the above figure does not include accidents on railways or in mines, which come under a separate schedule. Next, it is admitted that many more or less serious accidents are not notified to inspectors owing to neglect or evasion. Further, there are many unreported minor accidents, which may involve only trivial bodily injury, but nevertheless cause a heavy loss of production. The general ratio of minor to major accidents, Mr. Gaster put as at least ten to one. There would thus be something like 1,400,000 minor accidents each year, all causing some disturbance in factory routine and loss of production. Assuming that each minor mishap involves only half-a-day's absence from work, the number of working days lost annually through this type of accident alone amounts to 700,000. Mr. D. R. Wilson, in a contribution to the "Bulletin" of the British Industrial Safety First Association, has further pointed out that the productive capacity of a worker, even if he remains at work, may also be temporarily reduced. Thus even trivial accidents may, and do, cause a heavy loss in production.

While admitting the great value of the beneficent supervision of the Home Office in factory work, Mr. Gaster remarked that there are many accidents due to acts and faults of individuals, whether worker or employer, which cannot be dealt with by Act of Parliament, but only by processes of education. It has been claimed in the United States that 75 p.ct. of accidents are preventable. The adoption of "safety first" methods has led to substantial reductions.

### EFFECTS OF BAD LIGHTING.

Without wishing to create the impression that bad lighting is the only, or even the chief, cause of accidents, it is, the author went on, nevertheless a highly important item, both in relation to safety and as affecting health and efficiency in workshops. To take an extreme example, one has only to consider what happens when there is a failure in the supply, and the shop is in darkness. All work is immediately brought to a stop. If one next imagines that there is lighting available, but of a very inadequate nature, one can still understand that the worker can only perform a fraction of the work that he would do in the same time with good illumination. His progress will be slow, and his execution of work faulty. If there is moving machinery near, he will probably be oppressed by the consciousness that he must exercise care to avoid an accident. He will, in short, lack the confidence that is given by good lighting conditions.

Management and workers alike should feel that the possibility of a failure of light is reduced to an absolute minimum. In cases where such a failure would be a source of danger—as, for instance, in shops where workers are tending running machinery or cutting appliances—the provision of alternative systems of lighting to prevent complete absence of light should be regarded as essential. In cinemas, theatres, and other buildings licensed by the London County Council, special attention is invariably paid to the lighting of exits and to the provision of duplicate supplies as a safeguard against panic. Similar measures should apply to factories where failure of light may cause danger. In some of the large printing works, it is customary to have duplicate services for driving machinery. Continuity of lighting, which is equally important, may be secured in various ways.

### INADEQUATE LIGHTING AND FATIGUE.

As it is found in practice that the same causes which result in accidents involving bodily injury or prejudice to health are almost invariably also responsible for spoiled work, &c., Mr. Gaster suggested that occurrences of this kind should be grouped together and studied, when it would be seen that inadequate lighting plays an important part in the causation of such mishaps.

The first effect of inadequate lighting must be to increase the strain on the eyes; but the trouble does not end here. The result of difficulty in seeing is to accentuate the whole effort of the human organism and accelerate industrial fatigue, rendering the worker less alert, less able to do his work efficiently, and much more liable to accident. It has frequently been noted that the hours when workers are most fatigued, and can do least work, are also those during which accidents are most liable to occur. Good illumination, by removing this cause of fatigue and annoyance, is a benefit to worker and employer alike.

### RELATION BETWEEN LIGHTING AND OUTPUT.

Dealing with the results of investigations to ascertain the relation between lighting conditions and output, the author mentioned an experiment conducted by the Commonwealth Edison Company in Chicago, in 1919. A survey was made of 93 factories, totalling 17,400 employees. Observations of the existing methods of lighting were first made. All defects were then remedied, and modern and efficient conditions substituted. A number of factories consented to a test during a month under the new conditions measurements of illumination and records of output being taken simultaneously. The old conditions were then restored, and another test made for a subsequent month. Finally, the improved lighting was again substituted, and a confirmatory test undertaken. Remarkable results were reported. In one case the improved illumination caused outputs to increase by 8·27 p.ct.

However, all these facts are becoming more generally appreciated; and there has been a material improvement in industrial lighting during recent years. One of the chief tendencies, it seems, has been towards the provision of high general illumination, tion, in place of individual "drop-lights;" and in many factories it is now usual to find values up to 8 to 10 foot-candles. In some modern works, as much as 10 to 12 foot-candles is to be found. At the same time, it was pointed out that good lighting is not only a matter of providing sufficient numerical values of illumination. It is essential that other conditions—such as absence of glare and freedom from troublesome shadows—are also complied with.

### INSTRUMENTS FOR MEASURING ILLUMINATION.

Mr. Gaster referred to recommendations contained in Home Office reports on factory lighting; and then dealt with instruments for measuring illumination. Several new instruments have been developed both in this country and in the United States; and Bechstein has recently described a new form of instrument developed in Germany, which embodies many of the features of modern British and American types. The tendency of design is in the two main directions of simplification and greater accuracy. Whereas these instruments were originally regarded as chiefly intended for the expert, efforts are now being made to develop apparatus which even a person with little knowledge of photometry can soon learn to use. In particular, there is the idea of providing a scale on which the illumination can be read off by inspection, with little or no manipulation of the instrument to obtain balance. Mention was made of the photometer devised by Dr. Tuck in the United States, and of the notable improvements made in the various instruments invented by Dr. Clayton Sharp and Mr. P. S. Millar, both as regards simplicity and accuracy. The author suggested that experiments made may ultimately lead to a "direct reading photometer," the value in foot-candles being indicated by a pointer on the dial of a galvanometer, when the instrument is presented to the light. The instrument would have to be carefully calibrated in the photometric laboratory; but the user in practice would be relieved of the process of determining when two surfaces are equally bright. In view of the attention now being devoted to glare, a very simple apparatus, possibly based on diminishing the brightness of a source until some pattern becomes indistinguishable, would be useful to determine when the brightness in candle power per square inch exceeds a prescribed value.

### IDEAL REQUIREMENTS AND PRACTICAL SOLUTIONS.

Wherever the conditions of lighting have been carefully studied, the tendency during recent years has been to advocate a generous value of illumination, the cost of which is almost invariably small in comparison with the wages of operators. In a number of large factories which have recently come under the author's notice, this proportion was only 1 p.ct. Figures from America were quoted to show that the requirements contained in the Home Office Departmental Committee's reports are quite moderate in view of conditions to be found in some modern installations. These conditions can be readily met by the aid of modern appliances and methods.

Legislative methods, Mr. Gaster said, require very careful consideration. One might justly hesitate to legislate on many matters in which recommendations can confidently be made. The aim should be to prevent any serious abuse of light, and yet impose no hardship on the manufacturer. If too exact and detailed, a code becomes difficult to enforce without becoming a source of annoyance; if too vaguely worded, its interpretation may give rise to differences of opinion. An ideal measure is one which employers and workers readily accept as being made in their joint interests. Educational propaganda is extremely desir-

able, in order to make the aims of official reports generally understood, and the nature of their recommendations familiar. The discussions on industrial lighting before the Illuminating Engineering Society have, no doubt, proved most beneficial in this respect; and the opportunities which the Royal Society of Arts have afforded from time to time for the explanations of these matters, have also been extremely helpful. The Department of Scientific and Industrial Research have taken a sympathetic view of the matter; and it would be desirable that this Department should, in conjunction with the Illuminating Engineering Society, initiate experiments through the various research associations with which the Department have established relations.

There are other matters which have reached a stage when they might well form the subject of international discussion; and a step in this direction was taken by the International Illumination Commission at their first Technical Congress in Paris in 1921, when an international technical Sub-Committee were appointed to review the question of industrial lighting. While each country has its own methods, there is much "common ground" in industrial lighting; and it is conceivable that in the future these generally accepted principles will be embodied in an international code of industrial lighting.

The author closed by expressing the hope that the chief conclusions contained in the three reports of the Home Office Departmental Committee may in the near future be embodied in the legislation of this country relating to factories; and that light, heat, and ventilation will be dealt with jointly as essentials to health, safety, and efficiency in work.

### Points from the Discussion.

The paper (which was illustrated by a large number of lantern slides) led to a full discussion, the first speaker in which was Sir Malcolm Delevinge, K.C.B. (Assistant Under-Secretary of State, Home Office), who presided. He said the lecture had been an extraordinarily interesting one. Two things were rather remarkable about this question of industrial lighting. One was that a hundred years had elapsed before the subject began to arouse the attention it deserved. As they were aware, the official history of the subject in this country began with the appointment of the Home Office Committee only ten years ago. The other remarkable thing was the enormous amount of important work that had been done within these ten years. For this work, the Department were indebted very largely to the distinguished Chairman of the Committee (Sir R. Glazebrook), to the author of the paper that evening (who was one of the members of the Committee), and to others. Mr. Gaster had concluded with the hope that in the near future the recommendations of the Departmental Committee would be embodied in legislation. He did not think it would be any violation of official secrets to say that when the next Factory Bill came along, a clause on lighting would certainly be found in it. As the Departmental Committee had pointed out, one could not carry statutory provisions very far at the present moment. They could only be expressed in more or less general terms. It had been stated that, before one could fix anything like definite standards for fine and very fine classes of work, a great deal more data would have to be collected; and the Committee recommended that this work should be put in hand at once, with a view to fixing such standards as soon as possible. Within the last few months the Home Office had got into touch with the Joint Industrial Councils and other bodies representative of the employers and workers in the industries concerned in this question; and it was very satisfactory to the Department to be able to record that a great amount of interest in the matter had been developed. Arrangements had already been made in a number of industries for the collection of the necessary data. The industries themselves, as well as the Department, had really begun to take the matter in hand. At the same time, those who were interested in the improvement of industrial lighting could not rest satisfied until they had done something more than merely consult representative bodies. Something should be done to persuade the masters and the workers in the factories that the matter was of vital concern from the point of view of efficiency, economy, output, and health and comfort of the workers; and this could only be accomplished by some educational process.

Another speaker said that in America a census of 91,000 accidents showed that no less than 24 p.ct. arose entirely from inadequate lighting. What was needed in this country was action by the Home Office, or some properly constituted authority, to introduce and enforce standards of lighting for various industries. Nine or more American States had already codified lighting standards in this way. Even from the pounds, shillings, and pence aspect of the matter, it was going to pay manufacturers to go more fully into this question.

With reference to the 24 p.ct. above quoted, it appeared from subsequent remarks that the proportion had by 1921 been reduced to 18·2 p.ct.—thus showing that with the advent of better lighting conditions the accident rate due to faulty illumination has diminished.

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**Disintegration of Coal by Acids.**—There has been reprinted in pamphlet form (with a report of the discussion) a paper read by Dr. R. Lessing, F.C.S., before the Institution of Mining Engineers last November, on "The Disintegration of Coal by Acids." An abstract of the paper will be found in the "Journal" for Nov. 22, 1922, p. 495.

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

## Carbon Monoxide Conversion.

Sir,—It has for long been known that carbon monoxide can be converted into methane in accordance with the equations

$$CO + 3H_2 = H_2O + CH_4$$
$$2CO + 2H_2 = CO_2 + CH_4,$$

which are related through the water-gas equation. As to what would happen were it possible to operate a process so that methane and water only were the products, appears to me to be more interesting as an arithmetical parodox than from the technical standpoint, when one really comes to look into the matter.

One may assume that the gas to be treated, if manufactured by any process of economic importance, does not contain hydrogen materially in excess of 50 p ct. In accordance with the equation, the transformation of one volume of carbon monoxide involves the disappearance of three volumes of hydrogen, and, since the water condenses, the diminution of the volume of the gas by the same amount. The consequences are as follows:

(*a*) If the original gas contains 16 p.ct. of carbon monoxide, or a less amount, it can be practically freed from this constituent.

(*b*) As the carbon monoxide content increases between 16 and 33·3 p.ct., conversion of carbon monoxide equivalent to the whole of the available hydrogen has a diminishing effect in reducing the carbon monoxide content of the final gas.

(*c*) If the carbon monoxide content of the original gas is in excess of 33·3 p.ct., treatment by the suggested process increases the carbon monoxide content of the final gas over that of the original gas.

The simplest calculations will prove the truth of this statement.

M. W. Travers.

*Waldorf Chambers, 11, Aldwych, W.C. 2,*
*May 22, 1923.*

## Removal of Carbon Dioxide.

Sir,—Mr. B. Richardson's paper on "Corrosion and other Deposits in Gas Services," and Mr. J. G. Taplay's work on the "Life of Gas-Meters," open up the question as to the necessity of removing carbon dioxide from gas before distribution. As it is necessary to the commercial success of my process for the removal of carbon monoxide from coal gas, I naturally take great interest in the matter, and would suggest that the technical side of the industry should immediately tackle this important and interesting subject.

There are many simple ways of effecting this economically, depending more or less on local circumstances. We are dealing with the proposition at our works at Newark, in connection with hydrogen production; but I feel that the subject is of such importance to the industry that as many as possible should get a move on. The problem is the removal of carbon dioxide from town gas as a commercial proposition.

Recollect that we are selling therms, not inerts.

C. B. Tully.

*The Grey House, Carlton-on-Trent, Notts,*
*May 26, 1923.*

## National Gas Council.

Sir,—With reference to your abbreviated report of the Midland District meeting held in Birmingham on the 17th inst., Dr. Charles Carpenter, C.B.E., Chairman of the Gas Companies' Protection Association, was specially referred to by me, as well as Mr. Milne Watson, D.L., President of the National Gas Council, as entitled to the grateful thanks of the industry for their very able assistance and unstinted efforts at the recent inquiry into the method of charging for gas on the thermal basis. Their evidence convinced the Departmental Committee set up by the Board of Trade of the artificial character of the agitation which brought about the inquiry, and resulted in a recommendation that the method of charging for gas on the thermal basis should be continued and extended to all statutory gas undertakings within the scope of the Gas Regulation Act.

This inquiry happily resulted in complete vindication of the gas industry, due to a large extent to the convincing evidence given by Mr. Milne Watson and Dr. Carpenter, to whom the gas industry is greatly indebted.

J. Ferguson Bell,

*Derby Gas Light and Coke Company,*
*May 25, 1923.*

## Who is Mr. C. K. S. Hills?

Sir,—I wish to repudiate all knowledge of the letters signed by "C. K. S. Hills," and to state that I took immediate steps to contradict them. I never have, and never shall, advocate the removal of CO; it is of far too much value—it is absolutely necessary, for industrial gas, on account of its high calorific intensity.

My opinion is that there is too much fuss made about carbon monoxide; and the gas industry had better educate the public from the point of view of the gas undertakings, as well as from that of the consumers. Why not tell the latter that the illuminating effect of carbon monoxide in incandescent mantles is 48 p.ct. greater than that of hydrogen, and its calorific value 18 p.ct. greater? That it takes less air for combustion; consequently that it renders gas easier to burn, and less liable to waste or give-off fumes? Its removal will mean larger gas bills and dearer gas. The British public are not fools. Let them judge for themselves; tell them the truth, and not let them be led astray by ignorance.

What the country wants is cheap therms in the form of gas, and

not sentiment. "Hang" the composition, as long as it is satisfactory.

The electricians harnessed their "juice" and made it safe; we have to do the same—viz., harness CO.

According to the "Parliamentary Committee of the Gas Industry," the manipulation of gas has been known for years. After twenty years' work on this particular branch of the industry, I am lead to think that we are only just commencing to know anything about the subject. The technical side of the industry has most interesting and important work to tackle, demanding greater knowledge and skill than ever—and I hope better pay with it.

C. B. TULLY.

*The Grey House, Carlton-on-Trent, Notts,*
*May 28, 1923.*

# REGISTER OF PATENTS.

## Methanation of Water Gas.—No. 196,023.

HILDITCH, T. P., of Grappenhall, and CROSFIELD AND SONS, LTD., of Warrington.

No. 33,661; Dec. 14, 1921.

The patentees claim to have found that when ordinary water gas is passed over a suitable catalyst at a comparatively low temperature—that is to say, between 220° and 300° C., and preferably not higher than 280° C.—carbon dioxide and methane are produced, in approximately equal volumes, according to the equation $2CO + 2H_2 = CO_2 + CH_4$. Thus, if ordinary commercial water gas, containing 38 p.ct. by volume of carbon monoxide and 41 p.ct. of hydrogen, is passed at the rate of 45 litres per hour over 10 grs. of nickel at a temperature of 265° to 270° C., it is found that of each 10 litres of gas so passed approximately 3·1 litres of carbon monoxide and 3·8 litres of hydrogen disappear, and 1·5 litres of carbon dioxide and 1·6 litres of methane are produced.

It is preferred to deposit the nickel upon a porous, granular support which need not of itself be a catalyst for the reaction. If the metal be deposited as a compound (in the form, for example, of a hydrate, carbonate, or nitrate), it will before use be reduced at a suitable temperature—say, between 300° and 350° C. Although nickel has been named as the catalyst, cobalt, for instance, or a mixture of cobalt and nickel, may be used. Toxic impurities should be removed from the water gas before it is brought into contact with the catalyst.

The process can be employed either for enriching the water gas by methane or for the manufacture of pure methane.

For enriching, the purified and preferably preheated water gas is passed over the catalyst at the aforesaid temperature and at such a speed that the product (after removal of the carbon dioxide formed) contains carbon monoxide, hydrogen, and methane in the desired proportions. For the manufacture of methane alone, the water gas is passed over such of the catalyst and at such a rate as ensures that only small quantities of carbon monoxide and hydrogen are left; or, if desired, the once-treated water gas may, after removal of the carbon dioxide, be again submitted to the action of the catalyst.

The residual traces of hydrogen and carbon monoxide are readily removed by passage over heated copper oxide at a temperature of 200° to 250° C., at which temperature methane is but slowly attacked by the oxide. There will thus be obtained a mixture of methane with nitrogen (which latter was in the water gas); and from this mixture the methane can be separated in a pure condition by liquefaction.

## Atmospheric Gas-Burners.—No. 196,035.

LARKIN, F. S., of Putney, and GALBRAITH, W. L., of Westminster.

No. 694; Jan. 9, 1922.

According to this invention, there is provided a gas grill burner for heating and cooking purposes having means for equalizing the length and composition of the flame issuing from the burner jets. It combines a burner tube having jets or nozzles, an internal tubular member arranged within the burner tube, gas supply and mixing means secured to the inner tubular member and co-operating with the end of the burner tube, openings or orifices in the inner tubular member out of alignment with the jets of the outer burner tube, and a set-screw for supporting the inner end of the internal tube and for securing the two tubes together and positioning the parts in the desired relationship to each other.

The openings in the inner tubular member are so positioned as to ensure equality of pressure throughout the length of the burner. The burner is adapted to be rotatably mounted by means of the injector forming a bearing at one end, and the reduced portion of the outer tube forming a bearing at the other end, so that, when required for boiling, it can be turned on these bearings until the jets are clear of the frets below the level of which they are positioned for grilling purposes.

## Hot-Coke Chute Apparatus for the Manufacture of Gas.—No. 196,058.

BROCKWAY, F. G., of Elland.

No. 979; Jan. 12, 1922.

This invention relates to apparatus for the manufacture of blue or carburetted water gas in conjunction with horizontal or inclined retorts; and the object is to enable the producer to be economically fed with hot coke, whereby a reduction in fuel consumption, power required, and other working costs is obtained, besides simplifying construction.

The invention embodies a suitable water-gas producer characterized by being positioned below the floor level of the retort house; so that it can be fed by hot coke or partially gasified fuel discharged from the retorts down a chute capable of longitudinal and lateral traverse. Any other suitable means may be employed.

The gas take-off pipe from the producer may be connected to the works mains or foul-gas main, and may, by means of valves operated from a convenient position, and preferably working with interlocking gear, be utilized as a stack pipe during the blow. A superheater and carburetter may be combined with the producer.

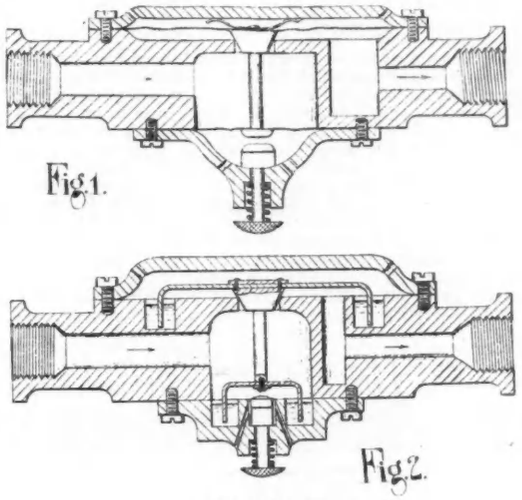
## Flow-Controlling Safety Device.—No. 196,075.

HARDING, W. G., of Sisters Avenue, S.W. 11, and BROOKMAN, A. W., of Arlingford Road, S.W. 2.

No. 1188; Jan. 13, 1922.

This invention relates to apparatus primarily intended for the control of gases; but it may equally well be applied to the control of liquids under pressure. It relates particularly to flow-controlling safety devices of the kind having a valve which is connected to a diaphragm under the influence of the supply pressure and which cuts off further supply after this has ceased for any reason; the supply only being resumed by movement of a hand-operated button opening the valve against the pressure.

Fig. 1 is a sectional elevation of one form of the device; and fig. 2 shows a modification thereof.




A Safety Cut-Off.

Referring to fig. 1, the valve is adapted to be controlled by means of two diaphragms, one of which forms one wall of the primary chamber in communication with the source of supply; while the other (which is of larger dimensions) is situated in the secondary chamber in communication with the outflow side. The valve is closed by means of a spring or a weight, and is held closed by means of the primary diaphragm.

The arrangement is such that when the fluid is flowing freely there is equal pressure per unit area on both diaphragms, so that the secondary diaphragm—being of greater area than the primary—resists the closing spring and maintains the valve open. Should, however, the supply fail, the closing spring comes into action to close the valve and thus shut off communication between the two chambers; and when the supply is resumed pressure is exerted on the primary diaphragm only, so that the greater the pressure the greater will be the tendency for the valve to remain closed upon its seat. To enable the fluid once more to flow freely through the system, it is necessary to release the valve from its closed position by means of an external button provided for the purpose.

The modified form shown in fig. 2 is similar, with the exception that the diaphragms are replaced by the members situated in the mercury chambers; or pistons might be used in place of the diaphragms.

The apparatus may be placed on the outlet or inlet side of the ordinary tap or other cut-off device, and may form part of the burner, bracket, or other fitting in the case of lighting.

## Drying and Neutralizing Sulphate of Ammonia. No. 196,115.

PHILLIPSON, G. A., of Langley Moor.

No. 2322; Jan. 26, 1922.

This invention relates to the production of dry neutral sulphate of ammonia from ordinary commercial sulphate, which usually has an admixture of free sulphuric acid, by subjecting the sulphate to the action of ammonia gas and simultaneously to agitation and drying. The neutralizing and drying processes, while continuous as a whole, are carried out in definite stages in a series of chambers.

The sulphate is caused to pass downwards from the uppermost of a series of superposed trays dividing the closed casing into compartments to the discharge outlet at the bottom; the sulphate being continually agitated in each compartment by scrapers carried by a vertical spindle, and so formed that in successive compartments the sulphate travels alternately outwards and inwards. The drying is effected by the introduction of steam or other hot vapour into the hollow bottoms of the trays—preferably connected in series with each other from the bottom to the top of the apparatus by pipes. Such apparatus is well known in processes for heating and dehydrating various solid substances of

granular or finely divided character. No claim is herein made to such apparatus *per se*, but only when associated with introducing the neutralizing gas into the chambers successively traversed by the sulphate.

Further, although excess of the neutralizing agent, moisture, and other vapours, such as pyridine, liberated from the salt, are withdrawn by suction from the casing during the continuance of the process, the feeding of the untreated salt is effected so as to preclude cold air being drawn in with it. Between the receiving hopper and the upper compartment of the casing is interposed a valve device, preferably of the character of an air lock, by which the untreated salt is fed into the apparatus from the hopper, but which, under all conditions, cuts off communication between the receiving hopper and the interior of the casing. This valve is automatic in its operation—that is to say, its rate of feeding is determined by the rate of progress of the salt through the apparatus, by level-gearing to the main spindle. Each chamber is provided with one or more inlet pipes for the supply of ammonia or gases containing ammonia with or without hot air or hot gases in addition; and all excess of these, together with moisture and vapours, such as pyridine, liberated from the salt under treatment, is withdrawn from each chamber by suction, and fed into a suitably arranged tower for recovery.

## Gas-Burners.—No. 196,166.

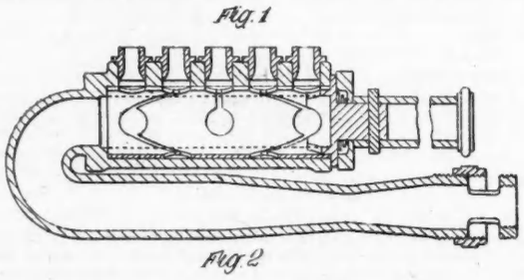
Tempany, F. R., of Golders Green, N. 4, and The Welsbach Light Company, Ltd., of Gray's Inn Road, W.C. 1.

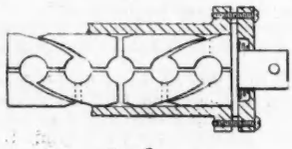
No. 8500; March 23, 1922.

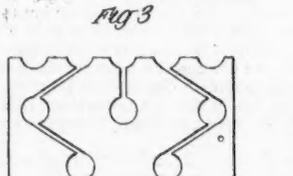
This invention relates to gas-burners of the type having a plurality of aligned jets, and in which it has been proposed to control the flow of gas by utilizing a ported sleeve valve; the latter being rotatable so that flow through some or all of the burners may be obtained at will. The object of the present invention is to provide an improved construction for such a burner.

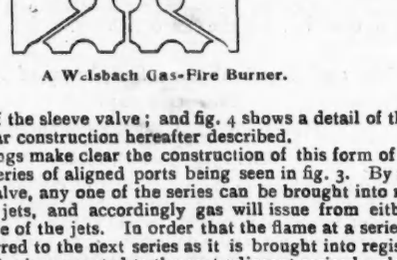
According to the invention the rotatable sleeve valve is provided with a plurality of connected series of ports adapted to permit flow through all or any selected jets of the burner by angular adjustment of the valve with regard to the jets; the arrangement permitting a flow of gas from the burner during rotation of the valve.

Fig. 1 is a vertical section through the whole burner construction; fig. 2 is a horizontal section through a part of the burner barrel—the contained sleeve valve being shown in plan view; fig. 3 shows a




A Welsbach Gas-Fire Burner.

development of the sleeve valve; and fig. 4 shows a detail of the valve in the particular construction hereafter described.

These drawings make clear the construction of this form of the invention; the series of aligned ports being seen in fig. 3. By rotation of the sleeve valve, any one of the series can be brought into registration with the jets, and accordingly gas will issue from either two, three, or all five of the jets. In order that the flame at a series of jets will be transferred to the next series as it is brought into registration, each of the series is connected to the next adjacent series by slots.

The sleeve valve is closed at the outer end by an end extension member, the collar on which is faced to provide a smooth bearing against the outer face of the barrel; and in order to assure a gas-tight joint, a fixing plate is bolted to the barrel, a spring being interposed.

In order to facilitate rotation of the valve, a tubular member may be added. This bears identification marks, so that an operator can ascertain which series of ports is in register with the jets. The sleeve valve is split so that it tends to spring outwardly against the inner wall of the barrel.

The patentees claim that this invention is particularly useful for gas-stoves, as, if it is required to leave a room to be gently heated, instead of turning the gas low so that a small flame (which is quite likely to be blown out) appears at the jets, a good flame can be obtained at one or more jets.

## Flow Meters.—No. 196,164.

Hodgson, J. L., of Leighton Buzzard.

No. 7922; March 18, 1922.

In flow meters in which the flow of air or gas is measured by means of a venturi tube, or a pitot tube, or the like, there is considerable difficulty, when the flow passing is only a small proportion of the maximum flow, in measuring accurately the difference of pressure which depends upon the flow. The most usual method of measuring the difference of pressure is to employ a liquid-sealed bell, of which the motion for any given difference of pressure is controlled by means of a float, which is moved into or out of the liquid by the motion of the bell. In such an arrangement, any change of temperature, or any rise or fall of the liquid in which the bell is immersed, due to condensation or evaporation (or other gain or loss of liquid), causes an error in the zero position of the bell. Further, a considerable percentage error may be caused at low flows by the friction of the guides which control the movement of the bell. These sources of error, which are negligible at high flows, may easily cause 100 p.ct. error at one-tenth of the maximum flow, where the difference of pressure is only one-hundredth part of the difference of pressure at the maximum flow. The present invention seeks to eliminate or reduce the above sources of error.

In this invention, the two pressures are caused to act on the two sides of a thin-walled liquid-sealed bell suspended from one end of a balance arm. At the other end of the arm is a compensating weight, which balances the bell and dips into the liquid which seals it. The cross-sectional area of that portion of the balance weight which may be immersed in the liquid by the movement of the bell is made so that any change in the liquid level due to expansion of the liquid or to evaporation or condensation or leakage of liquid will not disturb the balance and cause the bell to move. For instance, if the two parts of the balance arm are equal, the cross-sectional area of the balance weight where it is immersed in the liquid will be equal to the cross-sectional area of the walls of the bell. The bell and the compensating weight and the beam which carries them are suspended on knife edges. This eliminates practically all the friction. The amount of motion of the sealed bell for a given pressure difference is controlled by a float or weights attached to the balance arm.

If a float is used, it preferably dips into mercury. The float and the vessel may be so shaped as to produce any desired movement of the bell for any given difference of pressure. For instance, the movement may be made proportional to the square of the difference of pressure, except when the difference of pressure is very small; or the amount of movement of the bell at small differences of pressure may be increased even more than this. It is usually preferable to make the float of some simple shape, such as a cone or wedge; and if this is done, a motion proportional to the flow or to any given function of the flow may be obtained from the motion of the float by introducing a cam mechanism.

## Low-Temperature Carbonization.—No. 195,711.

Davidson, T. M., and Abbott, R. H. S., both of London

No. 34,941; Dec. 29, 1921.

This invention relates to the destructive distillation of coal and similar carbonaceous substances, and has among its objects to produce a hard, dense coke by distillation carried out at comparatively low, medium, or high temperatures. Also when carbonizing coal for metallurgical coke at high temperatures, it is one of the objects of the invention to make a coke fit for metallurgical purposes, and at the same time to recover the low-temperature oils.

According to the invention the retort is provided with three parts. Part 1 is a progressive low-temperature zone heated by spent gases; part 2 is a progressive medium or high-temperature zone heated by burning gases; part 3 is a coke-cooling zone in which the air supply for the combustion of gas in part 2 is heated by the heat contained in the coke; the coke being cooled by giving up its heat in this manner. The coal is progressively fed right through from the coal inlet to the opposite end, where the coke is discharged from the retort.

In the first part of the retort a concentrically disposed vapour-outlet pipe extends so that an annular space is formed between this and the retort, within which a worm is disposed to feed the coal through the retort. This part of the retort is of such a length that the coal reaches a uniformly plastic condition before it passes into the middle part of the retort. The gas and vapour drop in temperature as soon as they are liberated from the coal, thus preserving the oils.

By such a construction the charge within the retort is moulded to an annular section and is discharged into the second part of the retort, which, being heated by burning gases, is of higher temperature than part 1. In this chamber the charge is hardened to coke. While the coal is in a more or less plastic state it is subjected to mass compression by the worm; and during this pressing period its temperature is rapidly increased, so that the resulting residue is hard and dense. The rear part of the retort extends so far as to act as cooling chambers; being provided with flues in the adjacent setting through which air may circulate. Thus the heat of the residue may be utilized in preheating the air used for the combustion of gas in heating the retort.

The retorts are horizontally arranged, are of a cylindrical form, and are disposed in nests formed of tubes, in vertical and horizontal series, mounted within the setting. The retorts may be provided of a refractory material, or a metal may be used, such, for instance, as a chrome steel. Where, for example, six retorts are provided in one setting, these may be disposed in a series of two mounted in pairs, one beneath the other and in line; sufficient intervals being allowed between to permit of access of the heating gases over the whole surface of the retorts. The setting may have a series of vertical partitions which are alternately provided with communicating ports at their upper and

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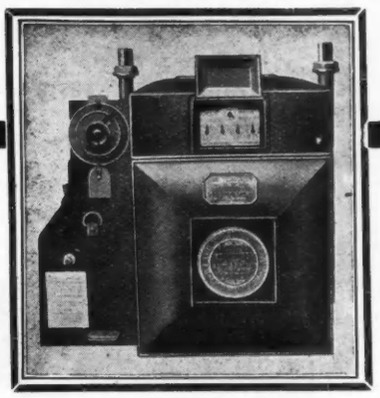

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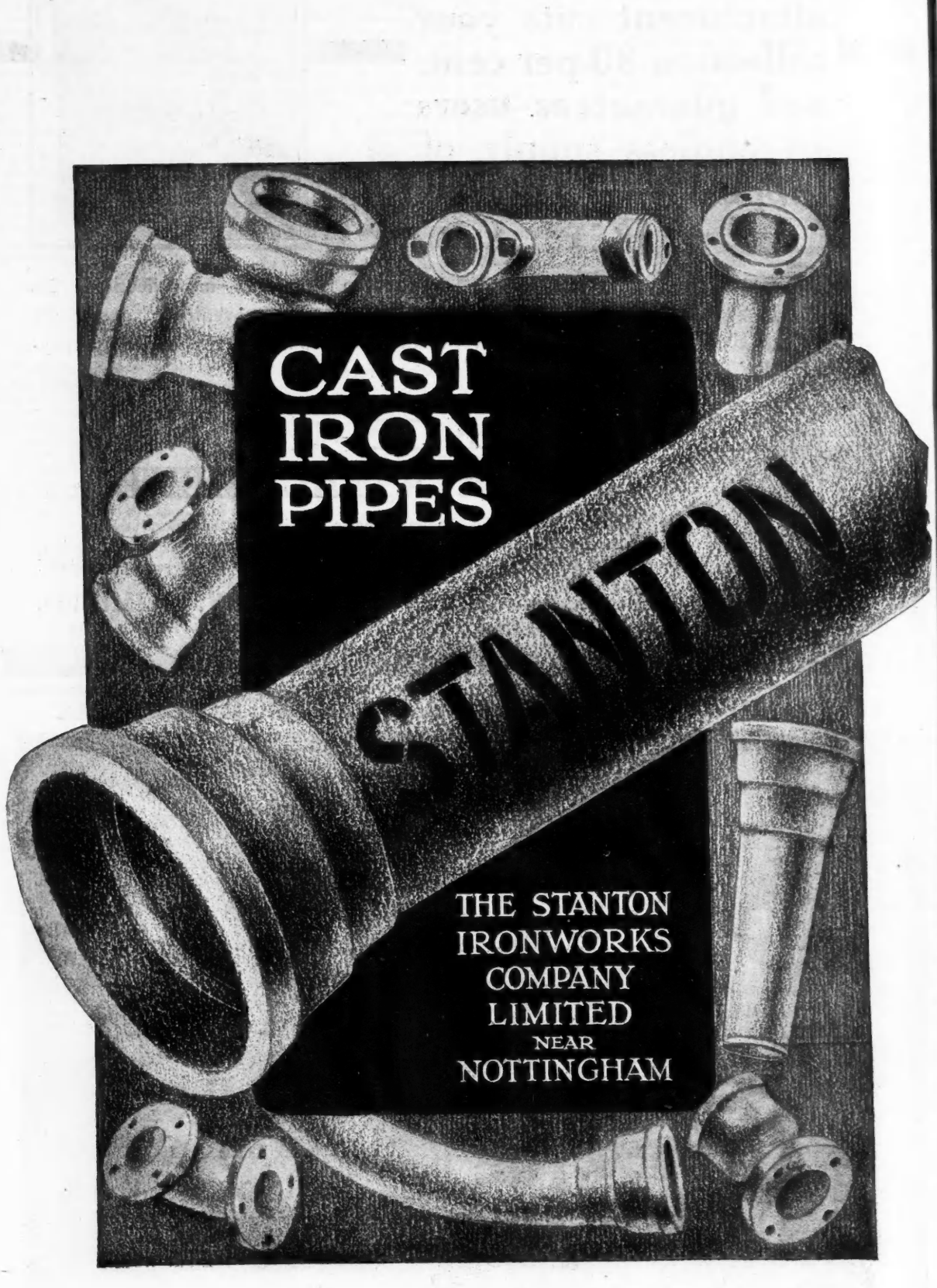
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lower ends to permit of a tortuous passage for the heating gases. Near the discharging end of the setting, at the commencement of the third part, a division wall is provided; and beyond this division wall the retorts extend to the discharging-box end of the setting. Vertical transverse partitions are provided to serve for the formation of air flues.

The first parts of the retorts protrude beyond the front of the setting for the reception of a pipe connection, through which the coal or other carbonaceous material in a finely divided condition may be passed into the retorts, and for the reception of a pipe connection for extracting the vapours given off during carbonization. The feeding worm is rotated within the annular space between the stationary vapour-outlet tube and the retort. A second worm may be provided within the vapour-outlet tube for the purpose of removing any carbon deposits that may collect within the tube. The cooled residue is withdrawn without leakage and under gas-tight conditions. The respective retorts may be provided with valves, by which any one may be shut-off from the hydraulic main. It is desirable that a final temperature of from 450° to 700° C. be attained within the retort. It is preferred to mix a non-coking with a coking coal.

### Gas-Washers.—No. 195,735.

BROCKWAY, F. G., of Elland.

No. 218; Jan. 4, 1922.

In apparatus for washing or cleansing gases by passing them through liquids, it is customary to use the potential difference in pressure between the mains and the liquid to force the gases through the washing medium. This restricts the amount of washing or contact to the limited back pressure allowable on the apparatus, which limitation frequently causes the gas to be insufficiently purified, and probably does not allow of more than one content being removed by absorption.

According to this invention the gas is trapped mechanically and subsequently released and atomized below the surface of the cleansing liquor, so that no pressure other than that necessary to cause the gas to fill the inlet chamber or chambers of the apparatus is necessary. The apparatus comprises an inlet chamber separated from the outlet chamber by a baffle plate dipping into the liquid seal. Pivoted at the lower extremity of this plate is an invert-trough, hollow vessel, or tray which may be rotated upon its pivot for the purpose of being lowered into, or raised out of, the cleansing liquor. The oscillation of the pivot alternately raises the inverted troughs above the level of the liquor, where they become filled with the gas to be washed on the return movement. As the troughs dip below the surface of the liquor, the gas is trapped in each trough, which, during this movement, subsequently releases the same. The gas, passing through the perforations in the pivot end of the trough, becomes atomized, in which state it passes out of the liquor on the outlet side of the baffle plate. Thus successive washing of the same stream of gas in different liquors may be accomplished.

### Pipe Joints.—No. 195,772.

DORMAN, W. H., & Co., and STEED, O. H. G., both of Stafford.

No. 788; Jan. 10, 1922.

This invention relates to pipe joints of the spherical or ball and socket type, and has for its object to provide a joint for suction-piping systems dealing with solid matter such as sand, grain, coal, &c. The ball portion of the joint, which is screwed on one end of a pipe section, is provided with a bore of which one end is conical, while the other is parallel and screwed to form a tight joint on the pipe end. This conical portion terminates at the periphery of the ball, and is preferably of such a size relatively to the ball socket that it will not leave any portion of the spherical surface of the latter exposed to the contents of the pipe when the joint is bent to its angle of limit. It will thus be seen that the material passing through the pipe will have an abrading action only on the inner conical surface of the ball portion. This part is renewable, and is preferably made of a hard metal such as cast steel.

The packing is of the V-shape type, held between two portions of the spherical surface forming respectively the socket and gland portions of the pipe joint. The open end of the packing is arranged towards the gland, and is provided with a wedge-shaped ring having a plain back portion bearing against the inner end of the gland. The latter is bolted on the socket in the usual manner; and adjustment between its inner end and the back of the wedge ring may be effected by interposing rings of any suitable thin material, such as brown paper. As an additional means of making the screwed end of the pipe fluid-tight in the bore of the ball, its extreme end is expanded against the inner end of the conical bore.

## APPLICATIONS FOR PATENTS.

**[Extracted from the "Official Journal" for May 24.]**

Nos. 12,806 to 13,403.

ABBOTT, J.—"Pipe joints or couplings." No. 13,007.
BEARD, G. F. H.—"Spirally-guided gasholders." No. 12,949.
BURGOYNE, J. S.—"Gas-burners." No. 12,813.
BURNERS (1921), LTD.—See Burgoyne, J. S. No. 12,813.
COCKEY & SONS, LTD., E.—"Valves for purifiers, &c." No. 13,008.
DAVIS, W. E.—"Furnaces and retorts." No. 12,980.
MARCONNET, G.—"Gas generators." No. 13,259.
SALERNI, E. M.—"Distillation of carbonaceous materials." No. 13,033.
SALERNI, P. M.—See Salerni, E. M. No. 13,033.
SMITH, LTD., J. & W. B.—"Gas burners." No. 12,873.
WATKINSON, F.—See Smith, Ltd., J. & W. B. No. 12,873.
WOODMASON, E. H.—"Gas-ring." No. 13,078.

**Abuse of Slot Meters.**—The Treasurer of the Methil Gas Commission has discovered that a consumer in Methil had been filing down half-pennies in order to make them fit a shilling slot meter. It was agreed to hand the case over to the police.

# MISCELLANEOUS NEWS.

## GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

**County Borough of Rotherham.**

The maximum price now authorized in respect of the supply of gas by the undertakers (other than by an Order under the Temporary Increase of Charges Act) is 3s. 3d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 0½d. per therm.

It is also proposed that an additional charge of 1½d. per therm should be authorized in respect of gas supplied through a prepayment meter.

**Oldbury Urban District Council.**

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price which they have asked the Board of Trade to substitute for this is 1s. 3d. per therm.

### SPECIAL ORDERS.

**Brentford Gas Company.**

Notice is given by the Company of their intention to apply for a Special Order under section 10 to provide for the transfer to them of the undertakings of the Harrow and Stanmore Gas Company and the Richmond Gas Company, to authorize the Company to use land described for gas-works purposes, to relieve the Company from the obligation to supply gas in cases where the capacity of the main is insufficient, &c.

**Bromsgrove Gas Light and Coke Company.**

The Company intend to apply to the Board of Trade for a Special Order under section 10 authorizing them to use land specified for gas-works purposes, and to raise further capital.

## GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

**Gloucester Gas Light Company.**

After the declared date, the maximum prices in respect of gas supplied by the undertakers shall be 16d. and 18·4d. per therm; and these prices respectively shall be substituted for the prices of 5s. and 6s. per 1000 c.ft. mentioned in section 21 (price of gas) of the Gloucester Gas Light Company's Act, 1872.

After the declared date, the word "therm" shall be substituted for 1000 c.ft. where this secondly occurs in section 56 (limit of price of gas) of the Gloucester Gas Light Company's Act, 1856. The minimum permissible pressure at which gas shall be supplied by the undertakers in any main, or in any pipe laid between the main and the meter having an internal diameter of 2 in. and upwards, shall be such as to balance a column of water not less than 2 in. in height. Provided that: (1) The foregoing provision shall not apply to the parishes of Barnwood, Hucclecote, Longford, Longlevens, Coney Hill, Saintbridge, and Churchdown, till after June 30, 1924; and till that date the minimum pressure at which all gas supplied by the undertakers to any consumer within the said parishes shall be that prescribed by section 28 (future pressure, quality of gas, testing place, &c.) of the Gloucester Gas Light Company's Act, 1872. (2) If the declared calorific value is less than 350 B.Th.U., the minimum permissible pressure at which gas may be supplied shall be that specified in the Schedule to the Order. (May 17.)

**Gosport Gas and Coke Company.**

After the declared date: (i) The standard price in respect of gas supplied by the undertakers shall be 12·2d. per therm; and this price shall be substituted for the price of 3s. 6d. per 1000 c.ft. mentioned in section 31 (as to standard price and dividend) of the Gosport Gas Act, 1908; (ii) the word "therm" shall be substituted for 1000 c.ft. and 1·2d. for 6d. in section 2 (power to charge higher prices outside Gosport) of the Gosport Gas Act, 1908.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four.

Prepayment meter clauses are included. (May 10.)

**Northampton Gas Light Company.**

After the declared date, the maximum prices in respect of gas supplied by the undertakers shall be 14d. and 16·4d. per therm; and these prices respectively shall be substituted for the prices of 5s. and 6s. per 1000 c.ft. mentioned in section 54 (limit of price of gas) of the Northampton Gas-Works Act, 1858. (May 10.)

**Shepton Mallet Gas Company.**

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 14d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five. (May 14.)

**Town of Dudley Gas Light Company.**

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18d. per therm. (May 23.)

## BRENTFORD GAS COMPANY'S AMALGAMATIONS.

### Harrow and Stanmore and Richmond Undertakings.

An Extraordinary Meeting of the proprietors of the Brentford Gas Company was held at Caxton Hall, Westminster, last Friday, to consider the draft of a Special Order for which application is proposed to be made by the Company to the Board of Trade under section 10 of the Gas Regulation Act, 1920, authorizing the acquisition by the Company of the undertakings of the Harrow and Stanmore Gas Company and of the Richmond Gas Company, and for other purposes. The meeting was presided over by Mr. R. J. Neville Neville (the Chairman of the Company).

The Secretary (Mr. H. L. Mann) read the notice convening the meeting.

The provisional agreements which have been entered into with the Harrow and Stanmore Gas Company and the Richmond Gas Company provide for the issue to holders of ordinary and preference stock and debenture stock of those Companies of ordinary or preference stock or debenture stock of the Brentford Gas Company at the following rates:

1.—Harrow and Stanmore Gas Company's stocks.
- (*a*) For each £100 of ordinary stock of the Harrow and Stanmore Gas Company, £112 10s. of "B" consolidated stock of the Brentford Gas Company.
- (*b*) For each £100 of 5 p.ct. consolidated preference stock of the Harrow and Stanmore Gas Company, £100 of 5 p.ct. preference stock of the Brentford Gas Company.
- (*c*) For each £100 of 4 p.ct. debenture stock of the Harrow and Stanmore Gas Company, £100 of 4 p.ct. debenture stock of the Brentford Gas Company.
- (*d*) For each £100 of 5 p.ct. debenture stock of the Harrow and Stanmore Gas Company, £125 of 4 p.ct. debenture stock of the Brentford Gas Company.

2.—The Richmond Gas Company's stocks.
- (*a*) For each £100 of ordinary stock of the Richmond Gas Company, £100 of 6 p.ct. debenture stock of the Brentford Gas Company, redeemable at 106 p.ct. on Jan. 1 and July 1 in any year, on six months' notice by the Company.
- (*b*) For each £100 of 5 p.ct. debenture stock of the Richmond Gas Company, £125 of 4 p.ct. debenture stock of the Brentford Gas Company.

The Chairman, by the aid of two coloured maps, explained the reasons which had led to the Directors' placing the scheme before the proprietors. He said the Brentford Gas Company had a big projection going northwards right into the middle of the area of the Harrow Gas Company. From the Brentford Company's works at Southall a canal went through part of the Harrow Company's district to the Welsh Harp at Hendon. The portion of the Brentford area going into the Harrow district was rather low, and therefore was an ideal position for the distribution of gas through the Harrow district. All the district bordering on the canal was becoming industrial, and, joined with Harrow, they would be able to furnish a special supply of gas to this area. There were also some new trunk roads, 60 or 70 ft. wide, which were going to give rise to a great deal of building in that portion of their area which, without the linking-up of the Harrow area, it would be difficult for the Brentford Company adequately to supply. If, however, they did join up with Harrow, they would secure facilities which they had been wanting for a long time past. Both during and since the war, they had "put their house in order" at Southall as far as they could; and they had at the present time surplus plant there. In fact, they had sufficient stand-by plant there to cope with the development which was taking place in the Harrow district. The building which was going on there now—both public work by the local authorities and private enterprise—was astonishing. Indeed, he did not believe there was at the present moment any district around London which could compare with the Harrow area in opportunities for future development. If the proprietors agreed with the suggestions of the Board, the Company's plant would be more fully employed; and a full employment of plant was one of the most desirable things that any undertaking could hope for. The Harrow Company had at times during the past twenty years doubled their output in about seven years. Brentford had doubled their production in about thirteen years. If Harrow went on doubling its demand for gas in anything like the same number of years that it had been doing, it would be very profitable business for the Company supplying it. Wembley was rapidly extending; and Stanmore was also growing. There was going to be a great area of houses—just the sort that gas companies liked—which would take gas for cooking, for heating, and for lighting.

As to the Richmond Company, their area projected right into the Brentford district. Mortlake and Barnes on one side, and Twickenham on the other, had always been difficult for the Brentford Company to supply, with the Richmond area in between. The task would be rendered much easier when the last-named area came under their control. For all these reasons, the Directors, who had gone into the matter very thoroughly, thought the proprietors of the Brentford Company would be well advised if they agreed to the proposed acquisition of the two undertakings named.

Proceeding to quote some statistics, the Chairman said the present area of the Brentford Company covered 90 square miles; the Harrow area was 32 square miles; and the Richmond area was 8 square miles. Therefore the scheme would mean an addition to the Brentford Company's area of supply of about 44 p.ct. In the matter of gas sales during 1922, the figures for the three Companies were: Brentford, 4619 million c.ft.; Harrow, 528 millions; and Richmond, 350 millions. Thus by the scheme Brentford would have an increased sale of nearly 20 p.ct. In the matter of consumers, the Brentford Company had 127,000, Harrow 14,000, and Richmond 9000; so that the amalgamation would give them about 23,000 additional consumers. At the present time the Brentford Company had 582 miles of main, the Harrow Company 115 miles, and the Richmond Company 42 miles. Thus the scheme would give the Brentford Company an additional mileage of mains of about 27 p.ct.; and the bulk of this was in Harrow—showing that Harrow had made as good provision as they could make for the development that was coming. These seemed to him to be the chief matters which had to be considered. The increase of area was very considerable; but the convenience of supply, with districts interlacing as these did, would be very great, and should enable them to sell gas more cheaply. The scheme would also provide facilities for the development of their own industrial area, which was one of the most important assets possessed by the Brentford Company to-day. They had purchased a piece of ground on the canal, with railway facilities, which would make an admirable site for the development of this district, when the great trunk roads of which he had spoken were completed, and promoted building, as had always happened in the past.

The Directors had, the Chairman went on to say, the greatest confidence in recommending the acquisition of these two undertakings by the Brentford Company. The Companies had been more or less *pari passu* with regard to capital per 1000 c.ft. of gas, and with reference to their dividends; and after many interviews and a great deal of negotiation the Board had settled the terms which were now submitted to the proprietors. If any further information was desired, he would be pleased to give it. Perhaps, however, he might say at once that the Special Order, in addition to the matter with which he had been dealing, was to give them power to acquire further land by agreement—another 20 acres—and to manufacture gas, &c., on the 35 acres of land to which he had already referred. Some years ago, it would be remembered, the Company tried to secure powers to manufacture gas on a site at Chiswick; but they met with strong opposition. The fact was that gas undertakings at the present time were in great difficulty with regard to new sites on which to manufacture gas. This was one of the things that would probably stand in the way of gas companies in the future. Luckily the Brentford Company possessed the site alluded to, which was far removed from any residential neighbourhood. There were also other provisions in the Order regulating the supply of gas. In conclusion, he moved:

> That the draft Special Order for which application is proposed to be made by the Company to the Board of Trade under section 10 of the Gas Regulation Act, 1920, authorizing the acquisition by the Company of the undertakings of the Harrow and Stanmore Gas Company and the Richmond Gas Company, and for other purposes, of which draft a print has been initialled for purposes of identification by the Chairman of this meeting, be, and the same is hereby, approved, subject to such alterations as may be made in the said draft Order, and as may be approved of by the Directors of the Brentford Gas Company.

Sir Robert Shafto Adair, Bart., formally seconded the resolution.

The Chairman, in reply to questions, said the "A" stock account was closed; and the "B" stock was the only stock of which they could issue further amounts. As would be seen, the two undertakings were being acquired on a share basis entirely. Of course, it would be necessary to compensate the Directors and the officers; and this was being done in the ordinary manner. Both Harrow and Richmond had reserves which would pass over to the Brentford Company along with the undertakings.

The resolution was then put and carried unanimously; and the proceedings terminated.

## TRADE NOTES.

### Vickers-Spearing Boiler Company.

We are informed that Messrs. Vickers, Ltd., have acquired a substantial interest in the Spearing Boiler Company, Ltd., and that the name of the latter Company will be changed to the Vickers-Spearing Boiler Company, Ltd. The Directors on the new Board will be: Mr. A. H. Spearing (Chairman), Mr. J. Kerr-Bock (of the Spearing Boiler Company, Ltd.), Mr. Douglas Vickers (Chairman of Vickers, Ltd.), and Sir Vincent Caillard (of Vickers, Ltd.). It is intended that the manufacture of all classes of land boilers shall be carried out at the Barrow works of Messrs. Vickers, Ltd.

**Dukinfield Gas-Works Accounts.**—Reporting to the Gas Committee on the working for the year ended March 31, Mr. George Lindley, the Manager of the Borough of Dukinfield Gas Department, stated that the sale of gas amounted to 86¾ million c.ft.—a decrease on the previous year of 2¾ millions. Of the total quantity of gas accounted for, 26·64 p.ct. was supplied to mills. The make of gas per ton of coal carbonized was 13,426 c.ft. (as compared with 12,675 c.ft. the year before); and the proportion unaccounted for, 10·5 p.ct. The gross profit amounts to £5477, and the net profit to £1648. Last year there was a loss of £4219.

**South African Lighting Association, Ltd.**—In presenting the accounts for the year 1922 at the annual meeting of shareholders to-day (Wednesday), the Directors will be in the happy position of being able to report an improved position. The sales of gas at both stations show an increase which, though not large, may be regarded as satisfactory, in view of the state of trade. The working results are better, and there are no abnormal repairs. The balance of net revenue is arrived at after making provision for special renewals which will be necessary in future years. The works are all in a good state of repair; and the overhaul of mains and meters is being continued. The Directors understand that the Grahamstown Municipality will proceed with the erection of their electricity works; but the Association will continue the gas undertaking in their own hands. One of the Directors, Mr. T. N. G. Jennings, has recently visited South Africa, and reports that he found the business being carried on in a satisfactory manner. An interim dividend of 3½ p.ct. was paid in October last; and, after providing for corporation profits tax and placing £500 to reserve, the Directors now recommend the payment of a further 4½ p.ct., making 8 p.ct. for the year, such dividend to be subject to the deduction of income-tax at 2s. 0½d. in the pound, this being the effective rate after allowing for the amount recovered by the Association in this country in respect of tax paid in South Africa. This dividend will absorb £4050, and leave to be carried forward a sum of £4487.

# SOUTH SUBURBAN GAS COMPANY'S CO-PARTNERSHIP MEETING.

## A Large Gathering at the Crystal Palace.

Some two thousand invitations had been issued for last Saturday's annual co-partnership meeting of the South Suburban Gas Company, at the Crystal Palace; and the large Concert Hall was well filled when Mr. CHARLES HUNT (the Chairman) rose to address the gathering. Among those supporting him on the platform were Sir Fortescue Flannery, Bart. (Deputy-Chairman), Mr. B. R. Green, Mr. Harold Gundry, and Mr. Alexander Dickson (Directors), Mr. W. G. Waller and Mr. E. P. Norton (Employee Directors), Mr. John Terrace (Chief Engineer), Mr. T. Anset (Chairman of the Co-Partnership Committee), Mr. J. Baker (Secretary of the Co-Partnership Committee), and Mr. F. Carter (Secretary of the Works Committee). To the regret of all, Mr. Wilfrid Wastell (the Secretary of the Company) was unable to be present, on account of the sudden illness of his wife. There were some good speeches; and the provision of a loud-speaking apparatus enabled these to be heard in all parts of the hall.

The CHAIRMAN, who was greeted with loud applause, remarked that, before they commenced the business of the meeting, he would like to refer very briefly to the great loss which co-partnership had recently sustained in the death of that veteran co-partner, Mr. Edward Owen Greening. They might recollect that two years ago Mr. Greening was at their annual meeting; and his stirring address on that occasion would not readily be forgotten. In the course of an exceptionally long life, Mr. Greening was always ready to spend, and be spent, in the cause of co-partnership; and his consistent advocacy of it would long be held in remembrance.

### THE BONUS AS A RESERVE FOR FUTURE NEEDS.

He (the Chairman) was very glad indeed to meet them all once more, and to feel that this, their anniversary of co-partnership, had been an enjoyable one for everybody connected with it. He thought also that they were in a position to congratulate themselves upon the completion of—on the whole—a very successful year. At all events, the Directors had been able to pay to co-partners the same amount, though not the same percentage, of bonus as was paid before the war, when the stockholders' dividend was 6 p.ct., which was the same dividend as the Company were now paying. The difference in percentage was due to the higher wages each co-partner still continued to receive, as compared with pre-war wages, together with the Company's inability to keep pace with this higher rate owing to the restriction of their standard price. The Directors hoped that before the time came for the payment of this bonus for the present year they might be in a position to propose a new scale to suit the new method of charging for gas, because they did feel rather strongly that the old scale, by which the amount of bonus depended on the price charged for gas, as originally proposed by Sir George Livesey, was the correct one, and should be followed if practicable. As to the actual amount of the bonus recently paid, it was to be remembered that this was not subject to any deduction for superannuation or anything of a similar nature. It was, or should be, a clear addition to the resources of every co-partner; and it was to be hoped that as much as possible of it might be invested in the stock of the Company, so as to form a reserve for future needs. It was a great satisfaction to the Directors that they had thus been enabled to restore to co-partnership that which had been lost by the war; and it was their hope that nothing less than the present bonus might be paid in future—even though they might not venture to anticipate an increase.

### CO-PARTNERSHIP SUPERANNUATION.

In this connection, he might refer to a record of which the Company had a right to be justly proud. In the latest publication of accounts of the Gas Companies of the Metropolis and Suburbs, it was seen that the amounts paid by the South Suburban Company for co-partnership and superannuation were the largest paid by any Company on the list, which included every Gas Company, Metropolitan and Suburban. If he might go a little further with his retrospection, he would like to couple with their Co-partnership Superannuation Fund the formation of the Works Committee as the two matters the making of which had given them unalloyed satisfaction in the past, and to which they looked forward to giving them equal satisfaction in the future. Take first the case of the co-partnership superannuation. They would remember that, prior to 1919, there existed only the officers' superannuation fund, which had been established in 1896, and the workmen's superannuation fund, which had been established ever since 1880, and which, subject to a small payment by the member of a few pence weekly, entitled the contributor in course of time to a pension on retirement, which, however, was altogether insufficient for his maintenance. He (the Chairman) had often thought of the possibility of a reform of such conditions, and had several times discussed with the employees' representatives on the Board the means by which it might be feasible to bring this about. One result of this unsatisfactory position was that workmen were reluctant to retire from the service until they were long past the age at which they could work either with credit to themselves or satisfaction to their employers. At length came the opportunity; and in 1919 an endeavour was made, with the help of some members of the newly-formed Works Committee, to bring about a much desired reform—the attempt being then made to supersede the old workmen's superannuation fund and the officers' superannuation fund, merging the funds of the two schemes into one fund, with the object of the new scheme providing: (1) Pensions for all co-partners in the service of the Company at Dec. 31, 1919, and for those entering the service after that date. (2) Special pensions for employees above 65 years of age at Dec. 31, 1919, who were ineligible for membership under any rules which might have to be decided upon. The subject was long and carefully considered; and before it was concluded a communication was made to the Committee who had the matter under consideration that the Directors felt that it was desirable to consider also the question of pensions for the widows of deceased members of the scheme. This was accordingly added to the scheme, which, with this addition, was now the most complete scheme of superannuation—so far as was known—of any hitherto adopted by any gas company. The number of members of this scheme on Jan. 1 of this year was 1219; and the total amount of pensions now being paid under the scheme was £5888. In that which had been described as one of the most important sections of the scheme (and he was not inclined to quarrel with this description)—namely, the provision for widows of members—it was gratifying to know that, of the total number of members eligible to join, 80 p.ct. had so joined, while the total numbers of persons receiving benefits under the scheme to-day were: Members, 58; widows, 10. To complete these statistics, he might say that the total amount standing to the credit of the fund was now £97,239. Lest, however, anyone should be under any illusion as to this seemingly large amount, and imagine that a dividend would shortly be forthcoming, he ought to say that this sum, and a great deal more, was estimated by actuaries to be required before the fund became firmly established. In reality, had the Board taken the advice of actuaries, the fund would never have been started. As it was, being started, the Directors intended to go on, and would probably have to devote a portion of their surplus profits to build it up in the same way that they built up the now defunct officers' superannuation fund. There was an old Border saying, that "What we have we hold!" He was sure they all knew the Board well enough to be assured that what they undertook to do would be done.

### THE WORKS COMMITTEE.

He would say a word in conclusion as to the formation of the Works Committee, in regard to which he would like to refer briefly to the report of their proceedings in December, 1918, by the "GAS JOURNAL," which report was afterwards circulated among the co-partners. A considerable part of the report was devoted to showing that, in the opinion of the Committee who had been considering the subject, the proposed Works Committee was an improvement upon the Whitley Committee, which had then been only recently introduced, and quickly became popular as a means of composing differences between employers and employed. This form of Committee had recently been strongly attacked by Lord Leverhulme, whose work for co-partnership entitled his opinions on the subject to be regarded with respect. While, however, he could not but agree with Lord Leverhulme as to the limited utility of Whitley Committees, he was unable to endorse his opinion as to their inadvisability. With much respect, it appeared to him, that they were a step in the right direction, but did not go far enough to effect any really useful purpose. This, however, by the way. Their own Committee, after fully considering the matter, arrived at the following conclusion: "We are of opinion that our Co-Partnership Committee can be adapted to carry out the functions of Works Committees more harmoniously and conveniently than any other form of Committee which excludes the special relations existing in co-partnership." Then followed other resolutions, ending with this very important one: "The Chairman shall announce to the Committee any proposed changes in wages, hours, or other conditions of labour; and the Committee shall be entitled to discuss the same and any problem arising therefrom. But any decision on such matters shall have regard to arrangements entered into for the gas industry." A resolution was thereafter carried accepting the Co-Partnership Committee as a Works Committee, &c. Since the formation of that Works Committee down to the present time, no fewer than 263 matters had been referred to it by co-partners from various sections of the works; and in nearly all of them decisions had been given satisfactory to all concerned. Need he say more? Was it possible for any system to give more satisfactory results?

### CO-PARTNERSHIP THE ONE SOLUTION.

Sir FORTESCUE FLANNERY said he never approached the subject of co-partnership without remembering with affection the speeches that used to be made by the father of co-partnership—their old friend Sir George Livesey. [Applause.] Sir George used to trace the history of civilization and of labour, and of the reward of labour, by reminding them that first of all the labourer was a serf or slave. Then after many generations he became a wage-earner; and now in modern days he had become, and was increasingly becoming, a co-partner, or sharer in the proceeds of the work that he did. This was the history of co-partnership as Sir George Livesey used to trace it; and they were there that day to record another step forward, and to make sure that the steps they were taking were safe and well grounded, and for the benefit of all concerned. All good workers were eligible for co-partnership, provided, of course, that they had demonstrated their skill and their steadiness. This was the basis upon which their system was founded. In connection with this great change that was going on in the manufacturing world, their Company were among the first to have Directors sitting at the Board, elected by the workers, and being themselves members of the working staff of the Company. He had made repeated efforts in the House of Commons to combat the feeling many in that House had that the employee director would sit at the board on sufferance, and without the right to take the fullest share in the deliberations. He could testify, and those present knew it was true, that their Employee Directors had always had a full share in the deliberations of the Board for the good of all concerned. They had heard from the Chairman that there was now nearly £100,000 allocated to the security of pensions, and that widows would benefit, as well as the older men who were past their work. In the old days, never was there to his mind so humiliating a spectacle as that of the labourer whose eye was growing dim, whose back was becoming bent, but who, because of the inhuman conditions that then prevailed, was obliged to go on working long after the proper time for rest had arrived. Now they were having this system of pensions for those whom they loved, and who were dependent upon them. The Company's area covered 120 square miles. There were works in four or five different places, and it was therefore difficult for the men to get together in social intercourse. This was an opportunity which was afforded them that day. He seconded heartily all the statements that the Chairman had made. These views advocating co-partnership should not only go all over that hall, but should go all over the industrial world. It was the solution of all those questions which had created so much ill-feeling between employers and employed. It was the one scheme which

would make those who were engaged in industry in every capacity look upon each other as brothers.

A Letter from Dr. Carpenter.

The following letter was read to the meeting from Dr. Charles Carpenter, who was unable to be present:

Dear Mr. Chairman,

I am greatly disappointed to find my throat is rather troublesome this morning, and I know by experience that I must avoid tiring it under these conditions. So I must beg you to excuse my attendance at this afternoon's festival. That my heart will be with you all, I need hardly say; and I am delighted to see a promise of such weather as will make the occasion a complete success.

I believe in the future of co-partnership as I do that the sun will rise to-morrow; and when the day dawns of its final triumph, the part played by the South Suburban Gas Company under the guidance of its two famous Chairmen will assuredly not be forgotten.

Charles Carpenter.

Official Reports.

Mr. J. Baker (Secretary of the Co-Partnership Committee) then submitted the co-partnership account for the year 1922, which he said was a very satisfactory one. The savings exceeded the withdrawals by £3000. The amount of bonus credited to 1317 co-partners was £9129, or 55 p.ct. more than the amount credited for the previous year. The balances on the account amounted to £23,731. The co-partners on Jan. 1 of this year held in stock and on deposit £94,000—not including the amounts standing to the credit of co-partners in the superannuation fund. As a great number of employees now owned over £100, he urged upon them the importance of making wills. Other matters were also dealt with by him.

Mr. F. Carter (Secretary of the Works Committee) followed with a report on the proceedings of the Works Committee during the past year. The Committee existed for the purpose of ensuring fair treatment in the relations between employer and employed. They had had a strenuous year, and had done their best with every problem that had been submitted to them. He quoted statistics showing exactly what had been done, and the amount of success which had attended their efforts. Much attention had been devoted to the matter of wages adjustment. It was, he said, true that the Committee had not been able to secure any relief at present from the reductions that had been made for the whole industry; but they had been very active. As far back as last July they had a lot of discussion about food prices; but the Company thought it undesirable to embark upon an inquiry into this matter. The Committee also asked for an inquiry into the zoning and grading which had been taking place in gas-works all over the country. The Committee thought that possibly under this arrangement employees of other gas companies were in a better position to stand the reductions. The inquiry took place; but, contrary to their expectations, it revealed that the conditions in the London Gas Companies regarding wages and status were practically the same. Another matter which affected the whole of the workers was the payment of wages for bank holidays to all employees. The Committee went thoroughly into this; and an inquiry was held to ascertain what was the custom among London Gas Companies. The inquiry, however, revealed no settled custom; and in view of all the facts the Committee resolved that, while of opinion that the extension of the principle of payment for bank holidays to all employees would be a desirable condition, the time was not opportune to press for consideration of proposals of this nature. The one thing needful to secure the full benefits of the co-partnership scheme was goodwill all round. With goodwill as the lubricant, co-partnership would no doubt work more perfectly than any other method devised to ensure the smooth running of their industrial machine.

Mr. T. Anset moved that the report of the Works Committee for the past twelve months be adopted; and Mr. F. Reed seconded.

Goodwill Essential.

Mr. H. Gundry considered these meetings very important, because they were, in fact, stock-takings. When they looked round and saw the progress that had been made, there was no doubt that the future of co-partnership was well assured. It was particularly gratifying to see that co-partnership was making wonderful strides outside, and that fresh people were beginning to agree with them that it was the one cure for industrial trouble. More newspapers, too, were taking up the matter. He agreed with Mr. Carter that goodwill was what was wanted. This was the very basis of co-partnership. He quoted from a leading article in the "Morning Post" what he considered a very good description of co-partnership. Talking of the relations of employers and employed, the writer said:

> The two are complementary and not antagonists. One cannot live without the other. The injury of either is the injury of both, and the welfare of the industries by which both live should be a bond of union, and not an apple of discord between them.

Mr. W. G. Waller, on behalf of the employees, thanked the Board for their kind invitation there that afternoon. The generosity of the Directors was deeply appreciated. They were specially grateful to their respected Chairman, Mr. Charles Hunt, for the sympathy and encouragement which he at all times so readily gave them.

After the Committee's report had been adopted, the Chairman asked if anyone would like to refer to any other subject.

Mr. L. W. Browne offered some criticism of the action of the Committee in connection with the reduction in wages, and said he thought they wanted a new Committee. As a co-partnership concern, they should govern their own internal affairs, and could set up a committee to determine the actual fall in the cost of living by which he was sure the men would be pleased to abide.

Mr. Jinks supported Mr. Browne, in a brief reference to the same matter.

Mr. Philip Holmes Hunt, being called upon, said he was very glad to accept an invitation to be present at the meeting, because, though he had resided for twenty years far away from the centre of co-partnership, he had always taken a very lively and keenly sympathetic interest in its development. He had arrived in England only a few days ago from Australia, to see how the gas industry of Great Britain stood to-day; and he felt it a very great privilege that his first contact with gas men outside the family circle should have been at the co-partnership meeting of the South Suburban Company. He had found Australia a place where any man in any sphere could get on and do well with hard work.

Mr. John Terrace drew attention to the fact that this year the Company's athletic sports are to take place on the Herne Hill Track, on Saturday afternoon, June 30. On his proposition, a vote of thanks was passed with acclamation to the Chairman for presiding. He said they all knew in their inmost hearts how very much sympathy Mr. Hunt had with every one in the employ of the Company, and that he had always done everything he could for the welfare of the employees in general. They had listened with great pleasure to his interesting address.

This brought the business meeting to a close; and subsequently the party were entertained at high tea.

## THE CO REMOVAL CAMPAIGN "BEYOND A JOKE."

### A Sensible Leader in a Provincial Paper.

A scientific correspondent writes that the carbon monoxide removal business and the publicity it has received are "beyond a joke;" and he encloses with his letter a sensible leader on the subject that appeared in the "Yorkshire Post" for the 19th inst. It is not often that we find a daily newspaper taking such a sane view of a matter of such importance to the gas industry. We therefore reproduce the article, and, at the same time, endorse our contemporary's protest against the newly developed practice of letters on matters of this kind being addressed to newspapers from the House of Commons. Apparently this move is to secure the attention of the editors—and publication.

The "Yorkshire Post" leader is as follows.

In our issue of yesterday, there appeared a letter from Mr. James Sexton, M.P., dealing with the reported discovery by Mr. C. B. Tully, of Newark-on-Trent, of a method of removing carbon monoxide almost completely from coal gas. In view of the great amount of attention which has recently been drawn to the poisonous properties of carbon monoxide and to the concomitant increased use of the domestic gas supply as a means of self-destruction, our correspondent concludes that "there is evidently at last a strong case for the prohibition of this deadly element in our household gas supply." There appears to be an increasing habit of dating letters of this kind from the House of Commons; and no doubt it gives them a semblance of special authority. For this reason, and for others, we think it right to state in the clearest possible way that, in our opinion, the conclusion just quoted is, to say the least, entirely premature and ill-considered.

The facts, which have been publicly recorded, are simply these. Mr. Tully, who, we believe, is well-known in the gas world as an inventor and as the advocate of a particular method of gas manufacture, has made certain trials at Newark of two methods of reducing the proportion of carbon monoxide in coal gas. It does not appear that either of these methods is in essence new; and the point of interest is how far they have been inventively adapted in practice so as to make it industrially and commercially possible to work them on the large scale of a town gas supply. The information before us gives no sort of adequate assurance on this point. The subject is clearly only in the preliminary stages, and however promising in the mind of Mr. Tully, we can find no evidence that would warrant a confident prediction of success.

We have, of course, no desire to discourage the inventor; but we feel that it is in the public interest to discourage the ill-informed advocacy, from whatever quarter, of State action or public support in reference to what after all is at the present stage nothing more than a very incomplete industrial and commercial experiment. We confess indeed to a distrust of enterprises attended by advocacy of this kind.

**Copy of Letter written by Mr. C. B. Tully, published in the "South Wales News" on May 26.**

SAFER GAS.

To the Editor.

Sir,—In a letter to you, Mr. J. M. Hogge suggests that our process for eliminating carbon monoxide from household gas should have the effect of modifying the conclusion of the Board of Trade Departmental Committee, which recommended that there should be no limitation of the proportion of carbon monoxide in gas used for domestic purposes.

With every deference to Mr. Hogge, I think that it would be inadvisable to alter the decision made by this Committee a couple of years ago. In the first place, it must not be forgotten that, although there is no law restricting the carbon monoxide content of gas, the Ministry of Health, when granting loans for gas plants, already stipulate that the carbon monoxide present shall not exceed 12 p.ct.

Again, we must remember the position of the gas undertakings of this country. During the war they "carried on" at great loss and sacrifice to themselves, in providing the necessaries for munitions; and whereas the railway companies came out of the war with millions to the good, it left the gas undertakings with their reserve funds exhausted and practically ruined. In these circumstances, it is only fair that gas undertakings to-day should be left with a free hand and no restrictions in the management of their concerns. Their war record justifies the belief that they themselves will be the first to adopt any process likely to prove of benefit to the community. What the public want is a cheap supply of clean gas, free from sulphur impurities; and, judging by the number of inquiries received, and by the interest taken by the gas industry as a whole, there need be no fear about the adoption of the carbon monoxide process.

C. B. Tully.

*Grey House, Carlton-on-Trent, May 23, 1923.*

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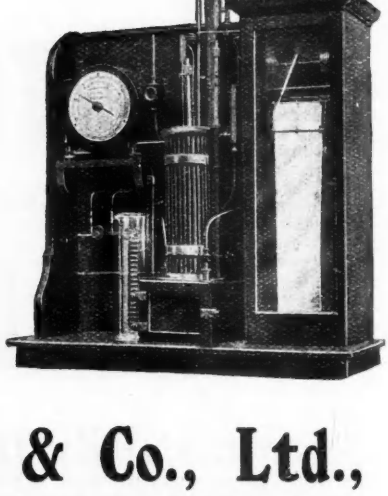

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## SHEFFIELD GAS COMPANY'S SPORTS AND SOCIAL CLUB.

The members of the Sheffield Gas Company's Sports and Social Club were favoured with fine weather on the occasion of the opening of their new Sports Ground at Wadsley Bridge on Whit Monday. The total area of the ground is 5 acres; and it is laid out in two hard tennis courts and one grass tennis court, a full-sized bowling green, and cricket and football grounds. A suitable pavilion, 80 ft. by 15 ft., has been erected.

The GENERAL MANAGER (Mr. Ralph Halkett) said it was two years since the men decided to form a Sports Club; and from that date they had been paying-in weekly subscriptions. He was pleased to say that they now had a substantial balance at the bank. Having formed the Club, the next step was to obtain a ground; and they were certainly fortunate in the Company's having such a beautiful ground to place at their disposal. On the Directors being approached, they willingly agreed to give the field, and also a substantial donation towards its laying out. They were all very much indebted to the following gentlemen: Mr. Chamberlain, the late Mr. White, who commenced the preparation of the ground, and last, but not least, Mr. Collett and his foreman Mr. Diver, for the time and attention they had given to the ground, with such splendid results.

In declaring the ground open, Mr. Halkett hoped that the employees would appreciate the kindness of the Directors in providing such grounds, which were so beautifully situated, and which no doubt would be beneficial from a health point of view, and that they would enjoy the pleasant rest and recreation.

A cricket match was played between teams of the Sheffield Gas Company and the City of Leeds Gas Department Recreation Club, the Sheffield team winning by eight wickets. Other games included tennis, bowls, quoits, &c. Afternoon tea was served on the ground.

After the cricket match, the members of the Leeds team were entertained at dinner at the Exchange Restaurant, Castle Street, Sheffield—Mr. Ralph Halkett presiding. Those present included Mrs. Halkett, Mr. and Mrs. Webb, Mr. Hullah, Mr. and Mrs. Collett, and Mr. S. T. S. Musgrove.

Mr. WEBB, in proposing the first toast, "The Sports and Social Club of the Sheffield Gas Company," said that these clubs were a necessity in all large business concerns. The Sheffield people were in possession of an excellent sports ground; and it was good policy on the part of the Directors to provide such a place, where the employees of the Company could gather together for recreation in their leisure hours. Also, it helped to create a feeling of goodwill between the officials and the workmen; and he hoped the employees of the Company would show their appreciation by giving the Sports Club the best support possible.

Mr. HALKETT thanked Mr. Webb for the way in which he had proposed the toast, and for the kind words he had said with reference to the Club. He quite agreed with Mr. Webb that such clubs in connection with undertakings were a splendid asset. They were a means of bringing the staff and workmen together, which undoubtedly was beneficial for their daily work, for it gave them the opportunity of knowing each other out of work as well as in it; and such conditions could not help but be beneficial to the undertaking. He was pleased they had had fine weather for the opening, and that they had had such a successful day. While Leeds had again lost the cricket match, they had shown true sportsmanship, and had made a good fight of it; and he hoped that these games would continue for many years to come. They regretted that Mr. C. S. Shapley, the General Manager of the Leeds Gas Department, was unable to be with them, owing to the ill-health of Mrs. Shapley; but they hoped that the holiday they were taking in the South would be beneficial.

Mr. MUSGROVE submitted the toast of "The City of Leeds Gas Department Recreation Club;" and Mr. HULLAH, in responding, thanked the Sheffield Club for their kind invitation to the opening of the new ground.

Mr COLLETT proposed a vote of thanks to the Chairman, and in the course of his remarks stated that it was entirely due to the initiative of Mr. Halkett that they were the proud possessors of such a good sports ground. Mr. Halkett was not only a supporter of the Club, but he was a good playing member; and it was up to them all to give him their loyal support.

Mr. HALKETT, in reply, said it always gave him great pleasure to attend these gatherings, and to see the employees and their friends enjoying themselves so harmoniously.

## SCAVENGING THE SKY.

### Evils of Air Pollution.

It appears from what Sir Arthur Holbrook, M.P., said in the course of a lecture on the "Smoke Nuisance," delivered to the London Society last Thursday, that in 1307 a man was tried, condemned, and executed for burning coal in London. According to Sir Arthur, he got what he deserved. It is, indeed, little short of criminal to pollute the atmosphere with coal smoke; and Sir Arthur had little difficulty in showing that the damage to buildings, vegetation, and public health which air pollution causes is a disgrace to modern civilization.

Speaking first of the damage to buildings, he pointed out that the cost of coal smoke to the nation is in this respect stupendous. The recent appeal for half-a-million pounds to save Westminster Abbey would never have had to be made, but for the unscientific way in which this nation burns its fuel. The Houses of Parliament alone demand about £2500 a year for their mere surface renewal; and, as Sir Arthur said, the Houses of Parliament are responsible for sufficient national expenditure without the addition of this item.

But the damage to buildings was not only to be condemned as waste of money; there was also the æsthetic side. And damage by smoke to vegetation had not only its æsthetic side, but seriously affected the availability and price of essential vegetable foods to city populations. The smoke problem was therefore an economic problem, an æsthetic problem, and a health problem. Atmospheric impurities injured the lungs and, especially when smoke fogs occurred, had a measurable effect upon the death-rate. Smoke, moreover, shut out the sunlight from our towns, thereby depriving the great mass of the nation of the best tonic, mental and physical, known to mankind. The value of pure sunshine—not filtered through a veil of smoke—was admirably demonstrated by the sun-treatment of disease, so successfully practised, not only in Switzerland, but in this country. We had the sunshine in Britain, if only we would avail ourselves of it.

But atmospheric pollution was unnecessary, though Sir Arthur reminded his audience that atmospheric pollution consisted of more than visible smoke, the tarry particles which darken the sky of every British town. Of these we could be rid by using smokeless solid fuels in place of raw, untreated coal. But the sulphurous acids, the invisible acids that helped to poison vegetation and corrode the stone of buildings, would still be present in the air if solid fuels were employed. Both smoke and invisible impurities could only be eliminated by using gaseous fuel—or electricity, wherever it was produced by water power, internal combustion engines, or any other method not involving the burning of crude coal in generating stations.

Sir Arthur concluded his lecture by pointing to the need for new and effective legislation against smoke. The present laws, he said, were easily evaded, and had become inoperative. If Essen and Pittsburg and New York could have clean air, why could not London? The public should insist on legislation—the nature of which he outlined, to show it need involve no hardship for industrial smoke producers—and realize in this country an ideal which had elsewhere been proved attainable.

## THE NORTH-EAST COAST COAL TRADE.

### From Our Own Correspondent.

Once again "not quite so firm" would seem best to describe this market during the past week. Especially has this been the case with steams—best screened Northumberland sorts having been reported sold by collieries direct at 30s., and second-hand at even less.

Several reasons can be suggested for the easier feeling which has prevailed. The strike troubles in Belgium have affected deliveries to that country, and thrown a certain amount of prompt coal back on to the market. The inquiry and demand for Germany has quite distinctly eased; the position there being no doubt affected by the record slump in marks. The Russian situation has not altogether cleared, and this may seriously affect the steam coal market for the second half of the year.

There have been several fairly large inquiries during the week from Scandinavia; but the French position is said to have eased considerably, especially for gas coal—partly owing to the adoption there of the extra summer-time hour, and partly owing to the supply of coal having been resumed from the Saar Mines.

On the whole, there is little, if anything, in the present situation to indicate any likely return to the strength of the market of a few weeks back. Buying for the second half of the year has not been particularly brisk at any time, and the weaker tone of the last two weeks has naturally caused buyers still more to hold-off in the hope of further price concessions. Collieries are, on the whole, sufficiently well sold, especially for next month, and are not yet inclined to come down to prices at which much business can be fixed up. But quotations do show an all-round decrease. Coking, for instance, for which all along there has been most demand, is now commonly quoted at 33s. for best qualities, which is a considerable drop from the 37s. 6d. which was the price at the top of the market. Wear Specials and best qualities of gas (Holmside, New Pelton class) may be called 32s. to 33s. for all positions, though collieries would find the higher price hard to get. Seconds are 31s. to 32s.

## YORKSHIRE AND LANCASHIRE COAL TRADE.

### From a Local Correspondent.

There was a holiday atmosphere in the Yorkshire and Lancashire coal trade last week, supplies being greatly restricted. The demand, however, was not so strong; the uncertain position in the Ruhr causing forward buying to be more cautious. The demand on home account is below the average, although the railway companies continue to take good supplies, and are maintaining their stocks. The demand for washed fuel of all descriptions is equal to the supply. For export, prices are a little easier; singles and doubles being quoted at 30s. to 31s. 6d. per ton f.o.b. Smithy peas continue to be in good demand with quotations firm at 32s. to 33s. 6d. per ton f.o.b. Values generally are easier; best bards being now about 32s. to 32s. 6d. per ton f.o.b. Furnace coke is in steadier request, with quotations 42s. 6d. to 45s. per ton f.o.b. House coal prices are easier, to stimulate the summer demand. In Cumberland, gas-producing coal is 29s. per ton at the works. The total tonnage of coal shipped from Hull during the week ended May 22 was 69,639 tons, as compared with 92,297 tons in the corresponding period in 1914 and 31,074 tons in the corresponding week of last year.

## COAL TRADE IN THE MIDLANDS.

### From Our Local Correspondent.

Notwithstanding reports as to a falling-off in the export demand, there are few indications of prices weakening in this district. Tension has been relieved to some extent as regards supplies of fuel; gas coke providing the most definite example. It is the seasonal decline in domestic consumption that is responsible for the changed position of gas coke, however. Generally, the industrial demand for fuel is well maintained in this part of the country. Slacks, beans, and D.S. nuts have stiffened up during the past fortnight, as, although pits in this

area have been making a steadier output than any elsewhere, the radius of distribution has been widened owing to the drafts on other districts for export. Quotations for household coal are easier.

Furnace coke is still taken up as fast as it can be obtained. The attention of foreign buyers has been more persistent than shippers reckoned on; but prices are generally adhered to. Home buyers have to pay 30s. and upwards at the ovens. Some South Wales collieries are asking 40s.; but this figure is quite out of harmony with the prevailing tone of the market. Pig iron prices are inclined to sag.

Owing to the intervention of the Whitsuntide holidays, few additions have been made to the contracts previously concluded for gas coal from midsummer onwards. In cases where collieries have been sounded as to contracting for shorter periods than twelve months, they have discouraged the idea. There is a fairly general desire to revert to the practice of yearly contracts without further qualification than the clause admitting of quarterly review as to prices.

## CURRENT SALES OF GAS PRODUCTS.

### The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 28.

There is practically no change to report in the market for tar products. The market for pitch is quite nominal. Creosote remains steady at 10½d. net per gallon. Pure toluole, 95 160 solvent naphtha, and pure benzole are unchanged; but there is a very considerable demand for pyridine bases.

### Tar Products in the Provinces.

*May* 28.

The average values for gas-works products during last week were: Gas-works coal tar, 77s. 6d. to 82s. 6d. Pitch, East Coast, 130s. to 132s. 6d. f.o.b. West Coast—Manchester, 127s. 6d. to 130s.; Liverpool, 129s. to 131s.; Clyde, 130s. to 132s. 6d. Benzole 90 p.ct., North, 1s. 6d. to 1s. 6½d.; crude 65 p.ct. at 120° C., 1s. to 1s. 0½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 8½d. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 6d. to 1s. 7d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, liquid, 8d. to 8½d.; salty, 7d. to 7¾d; Scotland, 6¾d. to 7¼d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 3s. 6d. to 3s. 7d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

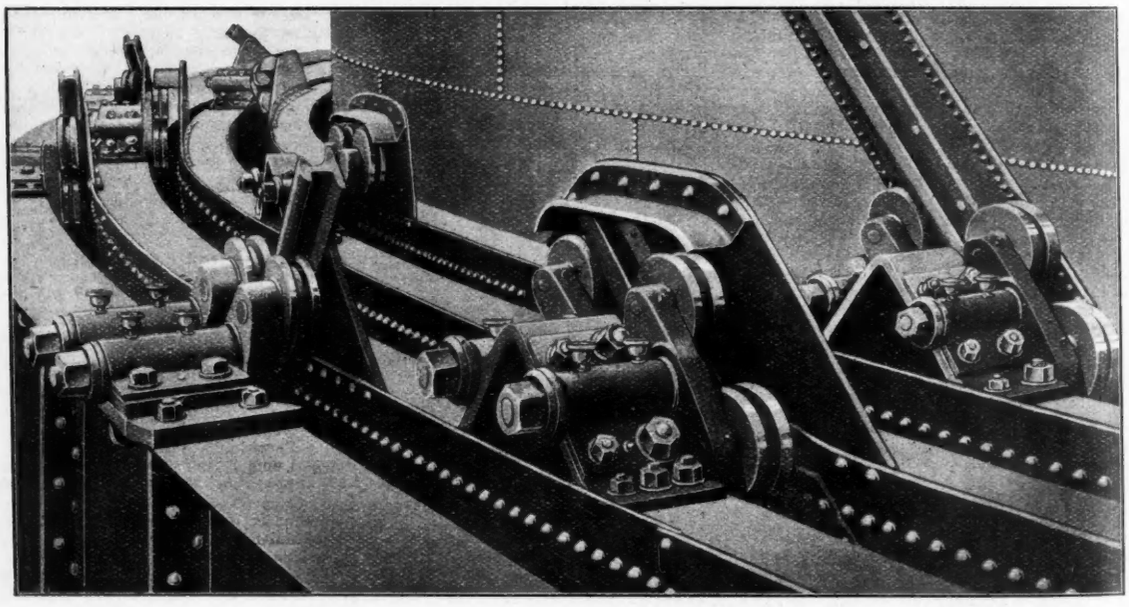
**Working Results at Llandudno.**—Some interesting figures were presented to the Llandudno Urban Council on Friday last. These showed that the total gas made during the past year amounted to 135,782,000 c.ft. The make per ton of coal carbonized was 19,747 c.ft., as against 16,466 c.ft. in the previous year.

**Cheaper Gas at Arbroath.**—The Gas Committee at Arbroath have, in view of the satisfactory result of the past year's working, and of the estimates for the current year, decided to fix the price for ordinary meters at 3s. 4d., compared with 3s. 9d. per 1000 c.ft. last year, and for slot or prepayment meters at 3s. 8d., as against 4s. 1d. per 1000 c.ft. last year, with the usual rebates for large quantities and for gas-engines.

**Gas-Works' Profit at Oldham.**—It was reported to the Oldham Gas Committee last week that the credit balance on the past year's working was £64,862, which, after payment of loans and sinking fund amounting to £41,234, left a balance of £23,628. From this, £7500 had been paid to the borough fund, leaving £16,128 to be applied to the reduction of the debit balance, which will then stand at £49,020. The Committee have decided to reduce the price of gas for power purposes by 1s. per 1000 c.ft., and for domestic uses, by 4d. per 1000 c.ft.

**Buckhaven and Leven Gas Commission.**—A report was submitted to a recent meeting of the Commission by Mr. H. A. Aitken (General Manager), on three proposals in connection with the gas-undertaking. He pointed out that a new works would involve an outlay of £90,000; and, while the working costs would be greatly reduced the interest and sinking fund charges would mean a net saving of only £26. With water-gas plant and centralization at Leven the net saving would amount to only £721, the equivalent of 2d. per 1000 c.ft. On the other hand, with centralization at Leven and an installation of vertical retorts the net saving would be sufficient to reduce the price of gas 9d. per 1000 c.ft. The capital outlay would be £40,000. The Commission agreed to hold a special meeting for the purpose of considering the question.

**Whessoe Foundry and Engineering Company, Ltd.**—The Directors will report at the annual meeting on Wednesday, June 6, that the profit for the year to March 31 last, after providing for taxation, amounted to £36,430; and after allowing for depreciation, &c., there is a net profit of £28,518, which, with the sum brought forward, makes the total available for distribution £39,246. Out of this, the Directors recommend a dividend of 10 p.ct. and a bonus of 5 p.ct. (both free of income-tax), leaving to be carried forward (subject to Directors' commission on profits) £9246. In addition to the trading profits above mentioned, a profit of £5836 was realized on the sale of certain temporary investments in Government securities; and this has been added to the general reserve account. The amount previously set aside for Government taxation has been adjusted in light of the reduction in the rates of tax; and a sum of £9163 has accordingly been carried to reserve, bringing the general reserve for equalization of dividends or other purposes up to £40,000. The financial year under review opened with unfavourable conditions; and owing to the stoppage in the engineering industry, the works were practically closed for two months. Since then conditions have somewhat improved; and although the demand is still below normal, and prices are keenly cut, the Company have been able to secure a fair share of the trade.



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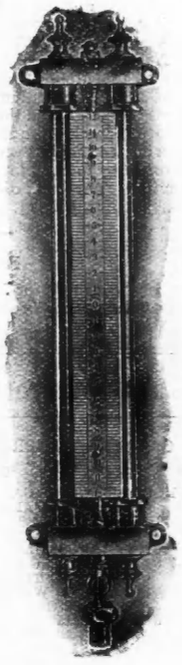

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Wires { "SAWER MANCHESTER." "SAWER NOTTINGHAM." "METRIQUE LAMB LONDON."

## Good Results at Morecambe.

When referring last week to the results of the past year's working of the Morecambe Gas Department, it was stated that there was a surplus of £495 after meeting all charges. The net profit should, however, have been given as £5495. Councillor Wilson (the Chairman of the Gas Committee), submitting the balance-sheet to the Town Council, remarked that last year it was his misfortune to announce a loss of £5456 This year he had a different story to tell. Not only had they wiped off the deficiency of last year, but they had made a small profit of £39. The expenditure for the last twelve months was £25,632, and the income £43,351, leaving a gross profit of £17,719, which, after deducting £12,223 for net revenue charges, interest on loans, sinking fund, &c., gave a net profit of £5495. The gas consumption for the year was 139,592,000 c.ft., an increase of 7,040,000 c.ft. over the previous year. The receipts from residuals showed a decrease on coke of £2516, but an increase on tar of £830. Repairs and maintenance of works had cost £4713. The Gas Committee had decided to make a substantial reduction in the price of gas next August. He paid a tribute to the management of the Engineer (Mr. Thos. W. Barratt).

## Gas-Mantle Manufacturer's Affairs.

At Bankruptcy Buildings, Carey Street, W.C., on Friday, May 18, the first meeting of creditors was held of William George Field (trading as W. G. Field & Co.), merchant, late of No. 2, Evelyn Street, Deptford, S.E. The Receiving Order was made against him on May 1, on a creditors' petition. For about sixteen years prior to 1918 debtor was employed as a chemist by various firms, chiefly by a Company carrying on business as manufacturers of gas-mantles. In January, 1918, he commenced manufacturing gas-mantles on his own account at No. 2, Evelyn Street, with a free cash capital of £2000. He leased the premises for twenty-eight years; but the business was not successful, and he lost money. In February, 1921, he formed a limited company to take over the business; the sale consideration being an agreement to employ him for a minimum period of seven years and to allot him 11,500 fully paid shares of 1s. each in the Company, which was formed with a nominal capital of £10,000. Debtor was appointed Managing Director; but owing to lack of capital the business had been practically at a standstill since the promotion. When the Company was formed he was relieved of liabilities amounting to £14,856; but there were others with claims amounting to £1000 who stood out and would not agree to the Company's taking over the business. These creditors subsequently pressed him for payment. Debtor attributed his present position to loss on trading due to cancellation of orders at the time of the Armistice, to the general slump consequent on the cessation of hostilities, and finally to the inability of the Company to obtain capital. He estimated his liabilities at about £1000, and his assets consisted of book debts amounting to £100. The estate was left in the hands of the Official Receiver for administration.

**Profit at Evesham.**—At a meeting of the Evesham Town Council last Wednesday week, the Mayor (Alderman Fisher) said the demand for gas during the year had increased; 76,000,000 c.ft. having been made against 70,375,000 c.ft. in the previous year. The gross profit of the gas-works for the year was £2026, and the net profit £978. Coal cost £12,179, compared with £18,523 in the previous year; but there was a considerable decline in the value of residuals. He anticipated an increase in the price of coal during the year, and doubted if residuals would show a corresponding increase. He considered that they were well round the corner, after a difficult time, and that the outlook was fairly satisfactory.

**Birmingham Gas Department and the Rates.**—The Birmingham Corporation Gas Committee will not be able this year to make any contribution from the profits of the undertaking to the relief of the rates. The accounts of the department just officially presented show, however, a surplus profit of £52,418, as against £20,215 last year; and, as was the case then, the amount is transferred to the special maintenance account of the department. It will be remembered that the Temporary Increase of Charges Act empowered the department to charge a price for gas up to a maximum of 6s. per 1000 c.ft., as against the old statutory maximum of 4s. Although for some time the maximum price has been below the 4s. level, during the greater part of the year it was above this figure.

**A Probable Reduction at Nantwich.**—A probable reduction in the price of gas was foreshadowed by the Chairman of the Gas Committee (Mr. Peake) at a meeting of the Nantwich Urban Council last week. In referring to the Gas Manager's annual report, he pointed out that the satisfactory feature was that there was a balance of £1578. This result, he said, fully justified the optimism of their last Chairman (Mr. Rollings), who promised a reduction in the price of gas at the end of the financial year. He hoped, in making a reduction, they would not neglect their first duty of establishing a reasonable reserve fund. The Chairman of the Council (Mr. A. Rollings) said he thought they had turned the corner, and great credit was due to their Manager for the way in which he had conducted the affairs of the undertaking. No one could have a more loyal official than Mr. Vernon. The building-up of a reserve fund was a very wise step to take; but the Council must not overlook the fact that they were not producing gas for the sake of profit, but to supply the consumer at the lowest possible price.

Voting has taken place at Carleton, near Poulton-le-Fylde, on a proposal to take advantage of Poulton's gas supply for the township. A heavy poll ended in a surprising result—a dead heat. The figures were: For, 152; against, 152. As a two-thirds majority was required, the proposal was lost.

The Blyth Gas Company are offering for sale by tender £35,000 of 5 p.ct. ordinary stock, at a minimum price of 110, which, at the rate of dividend proposed to be paid (7½ p.ct.), will give a return of £7 0s. 11d. p.ct. per annum. Tenders must be received at the Company's offices, Bridge Street, Blyth, before 3 p.m. on June 6.

# STOCK MARKET REPORT.

THE Stock Exchange has had as uninteresting a week as it has had for a long time. It began on Tuesday (when it re-opened after the Whit Monday) heavy and dull, and with no spirit in the business. Both Home and Foreign affairs were the reverse of exhilarating, and prices seemed to crumble away almost automatically. Wednesday was no better, and prices continued to decay; Home Government issues, Rails, and the Foreign Market being prominent. Some recovery was perceptible on Thursday; but Friday was dead quiet, and movements were small. In the Funds, the big four finished thus: Consols 58-58 3/16, War Loan 100 15/16-101 3/16, Funding 92 3/8-92 3/4, Victory 93 3/8-93 3/4.

Business in the Gas Market was much quieter, owing to the mutilation of the week; but the firmness was unabated, though the muster of advanced quotations was less numerous. They were, however, liberal in scale—viz., Croydon sliding-scale rose 1, Newcastle 1 1/2, Plymouth 7, South Shields 5, Southampton debenture 5, Imperial Continental 7, Continental Union 5.

The following transactions in gas during the week were recorded: On Monday, the London Stock Exchange was closed. On Tuesday, Brentford "A" 104 1/2, Cape Town 6 7/8, European 9 1/4, Gas Light ordinary 100, 100 3/8, ditto 3 1/2 p.ct. maximum 68 1/4, ditto 4 p.ct. preference 82, ditto 3 p.ct. debenture 64 1/4, Imperial Continental 172 1/2, 173, 174, 175, 176, 177, 178, 180, ditto 3 1/2 p.ct. debenture, Primitiva 8s., ditto 5 p.ct. preference 37s., 37s. 6d., South Metropolitan 99 1/4, 99 3/8, ditto 3 p.ct. debenture 64 1/2. On Wednesday, Bournemouth "B" 128, Continental Union preference 61, Gas Light ordinary 99 7/8, 100, 100 1/2, 100 3/4, ditto 4 p.ct. preference 82, ditto 3 p.ct. debenture 64 3/8, 65, Imperial Continental 178, 178 1/2, 179, 180, ditto 3 1/2 p.ct. debenture 76 3/4, 77 1/8, Primitiva 8s. 3d., 9s., ditto 5 p.ct. preference 37s., 37s. 6d., 38s., South Metropolitan 99 3/8, 100, Wandsworth "C" 103, Brentford 7 1/2 p.ct mortgage 103 1/2, 104, Hornsey 5 p.ct. preference 93. On Thursday, Brentford "A" 103 3/8, 104 1/2, Commercial 4 p.ct. 98, European 9 3/8, Gas Light ordinary 99 3/4, 99 7/8, 100, 100 1/8, 100 1/4, 100 1/2, 100 5/8, ditto 3 1/2 p.ct. maximum 68, 68 1/4, 68 3/8, 68 1/2, ditto 4 p.ct. preference 83, Imperial Continental 178, 180, Liverpool 7 p.ct. preference 107. 107 1/2, 108, 108 1/2, Newcastle 90, Oriental 99 1/2, Primitiva 5 p.ct. preference 37s. 6d., South Metropolitan 99 1/2, South Shields 130, Southampton 4 p.ct. debenture 78, Wandsworth-Wimbledon 112 1/2, Ascot District 4 p.ct. debenture 66. On Friday, Cape Town 6 7/8. Commercial 4 p.ct. 98 1/2, Gas Light ordinary 99 3/4, 100, 100 1/4, 100 1/2, 100 3/8, ditto 4 p.ct. preference 82, 83, ditto 3 p.ct. debenture 65, Imperial Continental 177, 180 181, Liverpool 7 p.ct. preference 107 1/2, 108, 108 1/2, Oriental 100 1/4, Portsea "B" 106, 107 1/2, Primitiva 7s. 6d, ditto 1911 debenture 58 1/2, South Metropolitan 99 ditto 3 p.ct. debenture 64, Southampton 5 p.ct. maximum 89 1/2, ditto 4 p.ct. debenture 78, Wandsworth New 102 1/2, 103, Preston 10 p.ct. "A" 133, ditto 7 p.ct. "B" 103.

In the Money Market there was a freedom from those pendulum-like alternations of tightness and ease, and the ruling condition throughout the week was quite comfortable. Discount terms continued very steady. Silver varied from day to day, in agreement with Oriental action. The Bank of England rate was 3 p.ct., as fixed on July 13.

## ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

| Issue. | Share. | When ex-Dividend. | Ante-War Dividend & Bonus. | Last Dividend. | NAME. | Closing Prices, July 30, 1914. | Present Prices. | Lowest and Highest Prices of Transactions. |
|---|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | | |
| 131,978 | Stk. | Feb. 22 | — | 5% | Aldershot 5 p.c. max. C. | .. | 74—79 | ... |
| 190,492 | ,, | ,, | 4 | 4% | Do. 4 p.c. Pref. | .. | 70—75 | ... |
| 1,551,868 | ,, | Apl. 5 | 2½ | 5% | Alliance & Dublin Ord. | 59—64 | 66—71 | ... |
| 374,000 | ,, | Jan. 11 | 4 | 4% | Do. 4 p.c. Deb. | 76—79 | 60—65 | ... |
| 280,000 | 5 | May 17 | 7½ | 4/- | Bombay, Ltd. | 5½—6½ | 4½—5½* | ... |
| 100,000 | 5 | Feb. 22 | 16 | 8/- | Bournemouth Gas and Water: 5 p.c. | .. | 11—12 | ... |
| 383,110 | 10 | ,, | 7 | 7/- | Bournemouth Gas and Water: B 7 p.c. | 15—15½ | 11½—12½ | 12⅜ |
| 115,000 | 10 | ,, | 6 | 6/- | Bournemouth Gas and Water: Pref. 6 p.c. | 13½—14 | 10½—11½ | ... |
| 162,065 | — | Dec. 29 | — | 4% | Bournemouth Gas and Water: 4 p.c. Deb. | .. | 77—82 | ... |
| 992,045 | Stk. | Feb. 22 | 14 | 6⅞/- | Brentford A Consolid. | 261—266 | 102—107 | 103½—104½ |
| 734,920 | ,, | ,, | 11 | 6⅛/3 | Do. B New | 204—209 | 102—107 | ... |
| 55,000 | ,, | ,, | 5 | 5% | Do. 5 p.c. Pref. | 109—111 | 85—90 | ... |
| 221,400 | ,, | Dec. 14 | 4 | 4% | Do. 4 p.c. Deb. | 91—93 | 78—83 | ... |
| 214,775 | ,, | Mar. 8 | 11 | 11% | Brighton & Hove Orig. | 208—213 | 175—180 | ... |
| 244,200 | ,, | ,, | 8 | 8% | Do. A Ord. Stk. | 154—159 | 130—135 | ... |
| 1,272,500 | Stk. | Feb. 22 | 5 | 5% | Bristol 5 p.c. max. | .. | 92—95 | ... |
| 570,000 | 20 | Mar. 22 | 12½ | 10/- | British A Ord. | 44—45 | 12½—13½ | ... |
| 10,000 | 10 | Dec. 29 | — | 7/- | Do. 7 p.c. Pref. | .. | 12—13 | ... |
| 120,000 | Stk. | June 29 | 4 | 4% | Do. 4 p.c. Deb. Stk. | 88—90 | 75—80 | ... |
| 220,335 | ,, | Dec. 29 | 4 | 4% | Buenos Aires 4 p.c. Deb. | 85—87 | 57—62 | ... |
| 100,000 | 10 | May 17 | — | — | Cape Town & Dis., Ltd. | 1½—2½ | 6—7* | 6⅞ |
| 100,000 | 10 | May 3 | — | 4/6 | Do. 4½ p.c. Pref. | 4—6 | 6—7 | ... |
| 100,000 | Stk. | Dec. 29 | 4½ | — | Do. 4½ p.c. Deb. Stk. | 70—75 | 72—77 | ... |
| 237,860 | ,, | ,, | — | 7½% | Cardiff 7½ p.c. Deb. | .. | 109—114 | ... |
| 157,150 | ,, | Feb. 26 | 5 | 5% | Chester 5 p.c. Ord. | 108—110 | .. | ... |
| 1,513,280 | ,, | Mar. 8 | 5/9/4 | 60/- | Commercial 4 p.c. Stk. | 106—108 | 97—100 | 98—98½ |
| 560,000 | ,, | ,, | 5⅝ | 60/- | Do. 3½ p.c. do. | 103—105 | 97—100 | ... |
| 475,000 | ,, | Dec. 14 | 3 | 3% | Do. 3 p.c. Deb. Stk. | 69½—71½ | 57—62 | ... |
| 800,000 | ,, | Dec. 15 | 4 | — | Continental Union, Ltd. | 76—79 | 30—35 | ... |
| 200,000 | ,, | Dec. 14 | 7 | 4% | Do. 7 p.c. Pref. | 115—118 | 62—67 | 61 |
| 660,000 | | Mar. 8 | — | 6% | Croydon sliding scale. | .. | 103—106 | ... |
| 284,975 | | ,, | — | 5% | Do. max. div. | .. | 83—86 | ... |
| 492,270 | Stk. | — | 6 | 4⅛% | Derby Con. Stk. | 123—125 | .. | ... |
| 55,000 | ,, | — | 4 | 4% | Do. Deb. Stk. | 102—104 | .. | ... |
| 209,000 | ,, | Apl. 5 | — | 5% | East Hull 5 p.c. max. | .. | .. | ... |
| 1,002,180 | 10 | Jan. 25 | 10 | 5/0 | European, Ltd. | 17½—18 | 9—10 | 9½—9⅝ |
| 16,546,120 | Stk. | Feb. 8 | 4/17/4 | 52/- | Gas Light & Coke: 4 p.c. Ord. | 98—102 | 99⅜—101½ | 99⅝—100⅝ |
| 2,600,000 | ,, | ,, | 3½ | 35/- | Gas Light & Coke: 3½ p.c. max. | 76—79 | 67—69 | 68—68⅛ |
| 4,062,235 | ,, | ,, | 4 | 4% | Gas Light & Coke: 4 p.c. Con. Pref. | 96—99 | 81—83 | 82—83 |
| 4,761,930 | ,, | Dec. 14 | 3 | 3% | Gas Light & Coke: 3 p.c. Con. Deb. | 72½—74½ | 62—65 | 64½—65 |
| 130,000 | ,, | Dec. 11 | 10 | 10% | Gas Light & Coke: 10 p.c. Bonds | .. | .. | ... |
| | — | — | — | — | Gas Light & Coke: 7½ p.c. Ilford Deb. | .. | .. | ... |
| 82,500 | ,, | Mar. 8 | 5 | 65/7½ | Hastings & St. L. 5 p.c. | .. | 92—97 | ... |
| 258,740 | ,, | ,, | 3½ | 50/7½ | Do. 3½ p.c. | 87—89 | 75—78 | ... |
| 70,000 | 10 | May 17 | 11 | 10% | Hongkong & China, Ltd. | 16½—16⅝ | 14—16* | ... |
| 86,600 | Stk. | Mar. 8 | 9 | 9⅛% | Hornsey 7 p.c. | .. | 147—152 | ... |
| 1,976,000 | ,, | Nov. 16 | 9 | £5 | Imperial Continental | 150—160 | 177—182 | 172½—181 |
| 404,800 | ,, | Feb. 8 | 3½ | 3⅝% | Do. 3½ p.c. Deb. Red. | 84—86 | 75—78 | 76½—77⅛ |
| 235,242 | ,, | Mar. 8 | 6½ | 6½% | Lea Bridge Ord. 5 p.c. | 119—121 | 93—98 | ... |
| 2,498,905 | ,, | Feb. 26 | 10 | 37/6 | Liverpool 5 p.c. Ord. | .. | .. | ... |
| 600,000 | ,, | Mar. 22 | — | 7% | ,, 7 p.c. Pref. | .. | 106—109 | 107—108½ |
| 165,736 | ,, | Feb. 22 | 7/5/6 | 80/- | Maidstone 5 p.c. | .. | 107—112 | ... |
| 63,480 | ,, | Dec. 29 | — | 3% | Do. 3 p.c. Deb | .. | 53—58 | ... |
| 75,000 | 5 | June 29 | 6 | 6% | Malta & Mediterranean Met. of Melbourne: 4½ p.c. Deb. | 4½—4⅝ | 3⅝—4⅛ | ... |
| 100,000 | 100 | Apl. 5 | 4½ | 4½% | Monte Video, Ltd. | 99—101 | 97—100 | ... |
| 541,920 | Stk. | May 17 | 4 | 4% | Newcastle & Gatsh'd Con. | 11½—12 | 57—62* | ... |
| 1,875,892 | ,, | Feb. 22 | 4½ | 5⅛% | Do. 4 p.c. Pref. Stk. | 98½—99½ | 89—90 | 90 |
| 250,166 | ,, | ,, | — | 4% | Do. 3½ p.c. Deb. | .. | 76—78 | ... |
| 529,705 | ,, | Dec. 29 | 3½ | 3½% | North Middlesex 10 p.c. | 82—83 | 70—72 | ... |
| 15,000 | 10 | Aug. 26 | — | 7/6 | ,, 7 p.c. | .. | .. | ... |
| 55,940 | 10 | Mar. 8 | 7/14/0 | 7/8⅝ | Oriental, Ltd. | 14—15 | 12—13 | ... |
| 300,000 | Stk. | May 3 | 8 | 8% | Plym'th & Stonh'se 5 p.c. | 117—122 | 97—102 | 99½—100½ |
| 188,120 | Stk. | Dec. 29 | — | 72/6 | Portsea Island, B | .. | 107—112 | ... |
| 60,000 | 50 | Mar. 8 | 13 | 65/- | Do. C | 128—131 | 103—108 | 105—107½ |
| 100,000 | 50 | ,, | 12 | 60/- | Primitiva Ord. | 118—121 | 100—105 | ... |
| 290,069 | 5 | — | 8 | — | Do. 5 p.c. Pref. | 5⅛—6 | ⅞—1⅛ | 7/6—9/- |
| 499,960 | 5 | — | 5 | — | Do. 4 p.c. Deb. | 4⅛—5 | 1⅛—2⅛ | 37/—38/- |
| 521,600 | 100 | Nov. 30 | 4 | 4% | Do. ,, ,, 1911 | 91—93 | 70—73 | ... |
| 600,000 | Stk. | Jan. 25 | 4 | 4% | River Plate 4 p.c. Deb. | .. | 57—60 | 58⅛ |
| 346,198 | ,, | Dec. 29 | 4 | 4% | San Paulo: 6 p.c. Pref. | 85—87 | 57—60 | ... |
| 150,000 | 10 | Mar. 22 | 6 | 6/- | San Paulo: 5 p.c. Deb. | 10½—11 | 5⅛—6 | ... |
| 125,000 | 50 | July 3 | 5 | 5% | Sheffield A | 47—49 | 38—41 | ... |
| 135,000 | Stk. | Mar. 22 | 10 | 5% | Do. B | 223—224 | 99—101 | ... |
| 209,984 | ,, | ,, | 10 | 5% | Do. C | 222—224 | 99—101 | ... |
| 525,500 | ,, | ,, | 10 | 5% | Shrewsbury 5 p.c. | 220—222 | 99—101 | ... |
| 133,201 | Stk. | Sept. 15 | 4 | 4% | South African | .. | .. | ... |
| 90,000 | 10 | Nov. 2 | 9 | 7% | South Met. Ord. | 10½—11½ | 7—9 | ... |
| 6,609,895 | Stk. | Feb. 22 | 5/4/0 | 60/- | Do. Red. Pref. | 111—113 | 99—101 | 99—100 |
| 250,000 | ,, | Jan. 11 | — | 5% | Do. 3 p.c. Deb. | .. | 97—99 | ... |
| 1,895,445 | ,, | ,, | 3 | 3% | Do. 6½ p.c. Deb. | 72½—74½ | 63—65 | 64—64½ |
| 734,000 | ,, | Mar. 8 | — | 6½% | South Shields Con. Stk. | .. | 105—107 | ... |
| 91,500 | ,, | Feb. 22 | 8½ | 8½% | S'th Suburb'n Ord. 5 p.c. | 157—159 | 129—131 | 130 |
| 1,087,795 | ,, | ,, | 6 | 6% | Do. 5 p.c. Deb. Stk. | 114—116 | 100—103 | ... |
| 368,837 | ,, | Dec. 29 | 5 | 5% | S'th'mpt'n Ord. 5p.c. max. | 116—118 | 95—100 | ... |
| 647,740 | ,, | May 3 | 5 | 7% | Do. 4 p.c. Deb. Stk. | 99—102 | 88—91 | 89½ |
| 121,275 | ,, | Dec. 29 | 4 | 4% | Swansea 7 p.c. Pref. Stk. | .. | 73—78 | 78 |
| 250,000 | ,, | Mar. 8 | — | 70/- | Do. 6½ p.c. Deb. Stk. | .. | 102½—104½ | ... |
| 200,000 | ,, | Dec. 29 | — | 6½% | Tottenham & District: A 5 p.c. | .. | 106—108 | ... |
| 120,000 | ,, | Feb. 22 | — | 7½% | Tottenham & District: B 3½ p.c. | 135—138 | 123—128 | ... |
| 782,275 | ,, | ,, | 6 | 6% | Tottenham & District: 4 p.c. Deb. | 115—117 | 102—107 | 80—80½ |
| 181,255 | ,, | Dec. 14 | 4 | 4% | Tynemouth 5 p.c. max. | 87—89 | 75—80 | ... |
| 258,251 | Stk. | Mar. 22 | 5 | 5% | Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c. | 108½—109 | 90—92 | ... |
| 30,000 | ,, | Feb. 22 | 8⅜ | 87/6 | De. B 3½ p.c. | 151—156 | 130—135 | ... |
| 255,636 | ,, | ,, | 6½ | 72/6 | Do. C. | 129—134 | 115—120 | ... |
| 128,275 | ,, | ,, | — | 61/3 | New Ordinary | .. | 100—105 | 103 |
| 140,865 | ,, | ,, | — | 61/3 | Wimbledon 5 p.c. | .. | 100—105 | 102½—103 |
| 352,000 | ,, | ,, | 6½ | 68/9 | Epsom 5 p.c. | 117—122 | 110—115 | 112½ |
| 98,000 | ,, | ,, | 6½ | 73/9 | 3 p.c. Deb. Stk. | 121—126 | 115—120 | ... |
| 88,416 | ,, | Dec. 29 | 3 | 4% | | 66—69 | 58—61 | ... |

* Ex. div.

### Erratum.

In the report for last week, last line but 4, for "*transactions*" read "*transitions*."


## SALE OF STOCKS AND SHARES.

GAS AND WATER STOCKS AND SHARES

in the

BOURNEMOUTH GAS AND WATER COMPANY
BROADSTAIRS GAS COMPANY,
ISLE OF THANET GAS LIGHT AND COKE COMPANY (MARGATE),
CANTERBURY GAS AND WATER COMPANY,
FOLKESTONE GAS AND COKE COMPANY,
GRAYS AND TILBURY GAS COMPANY,
SOUTHEND WATER-WORKS COMPANY,
GOSPORT GAS AND COKE COMPANY,
ASCOT DISTRICT GAS AND ELECTRICITY COMPANY,
ASH-NEXT-SANDWICH GAS LIGHT AND COKE COMPANY, LTD.,
WHITSTABLE GAS AND COKE COMPANY, LTD.,

to be sold by Auction by

**MESSRS. A. & W. RICHARDS**

at the CANNON STREET HOTEL, LONDON, E.C., on Tuesday, June 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 37, WALBROOK, E.C. 4.

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1,000,000 cubic feet capacity.

By F. SOUTHWELL CRIPPS.

*Price 10/6 net.*


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